

Über dieses Buch

Dies ist ein digitales Exemplar eines Buches, das seit Generationen in den Regalen der Bibliotheken aufbewahrt wurde, bevor es von Google im Rahmen eines Projekts, mit dem die Bücher dieser Welt online verfügbar gemacht werden sollen, sorgfältig gescannt wurde.

Das Buch hat das Urheberrecht überdauert und kann nun öffentlich zugänglich gemacht werden. Ein öffentlich zugängliches Buch ist ein Buch, das niemals Urheberrechten unterlag oder bei dem die Schutzfrist des Urheberrechts abgelaufen ist. Ob ein Buch öffentlich zugänglich ist, kann von Land zu Land unterschiedlich sein. Öffentlich zugängliche Bücher sind unser Tor zur Vergangenheit und stellen ein geschichtliches, kulturelles und wissenschaftliches Vermögen dar, das häufig nur schwierig zu entdecken ist.

Gebrauchsspuren, Anmerkungen und andere Randbemerkungen, die im Originalband enthalten sind, finden sich auch in dieser Datei – eine Erinnerung an die lange Reise, die das Buch vom Verleger zu einer Bibliothek und weiter zu Ihnen hinter sich gebracht hat.

Nutzungsrichtlinien

Google ist stolz, mit Bibliotheken in partnerschaftlicher Zusammenarbeit öffentlich zugängliches Material zu digitalisieren und einer breiten Masse zugänglich zu machen. Öffentlich zugängliche Bücher gehören der Öffentlichkeit, und wir sind nur ihre Hüter. Nichtsdestotrotz ist diese Arbeit kostspielig. Um diese Ressource weiterhin zur Verfügung stellen zu können, haben wir Schritte unternommen, um den Missbrauch durch kommerzielle Parteien zu verhindern. Dazu gehören technische Einschränkungen für automatisierte Abfragen.

Wir bitten Sie um Einhaltung folgender Richtlinien:

+ *Nutzung der Dateien zu nichtkommerziellen Zwecken* Wir haben Google Buchsuche für Endanwender konzipiert und möchten, dass Sie diese Dateien nur für persönliche, nichtkommerzielle Zwecke verwenden.

+ *Keine automatisierten Abfragen* Senden Sie keine automatisierten Abfragen irgendwelcher Art an das Google-System. Wenn Sie Recherchen über maschinelle Übersetzung, optische Zeichenerkennung oder andere Bereiche durchführen, in denen der Zugang zu Text in großen Mengen nützlich ist, wenden Sie sich bitte an uns. Wir fördern die Nutzung des öffentlich zugänglichen Materials für diese Zwecke und können Ihnen unter Umständen helfen.

+ *Beibehaltung von Google-Markenelementen* Das "Wasserzeichen" von Google, das Sie in jeder Datei finden, ist wichtig zur Information über dieses Projekt und hilft den Anwendern weiteres Material über Google Buchsuche zu finden. Bitte entfernen Sie das Wasserzeichen nicht.

+ *Bewegen Sie sich innerhalb der Legalität* Unabhängig von Ihrem Verwendungszweck müssen Sie sich Ihrer Verantwortung bewusst sein, sicherzustellen, dass Ihre Nutzung legal ist. Gehen Sie nicht davon aus, dass ein Buch, das nach unserem Dafürhalten für Nutzer in den USA öffentlich zugänglich ist, auch für Nutzer in anderen Ländern öffentlich zugänglich ist. Ob ein Buch noch dem Urheberrecht unterliegt, ist von Land zu Land verschieden. Wir können keine Beratung leisten, ob eine bestimmte Nutzung eines bestimmten Buches gesetzlich zulässig ist. Gehen Sie nicht davon aus, dass das Erscheinen eines Buchs in Google Buchsuche bedeutet, dass es in jeder Form und überall auf der Welt verwendet werden kann. Eine Urheberrechtsverletzung kann schwerwiegende Folgen haben.

Über Google Buchsuche

Das Ziel von Google besteht darin, die weltweiten Informationen zu organisieren und allgemein nutzbar und zugänglich zu machen. Google Buchsuche hilft Lesern dabei, die Bücher dieser Welt zu entdecken, und unterstützt Autoren und Verleger dabei, neue Zielgruppen zu erreichen. Den gesamten Buchtext können Sie im Internet unter `http://books.google.com` durchsuchen.

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

https://books.google.com

Digitized by Google

Com. & Adm.

Com. & Adm.

The University of Chicago
Libraries



Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

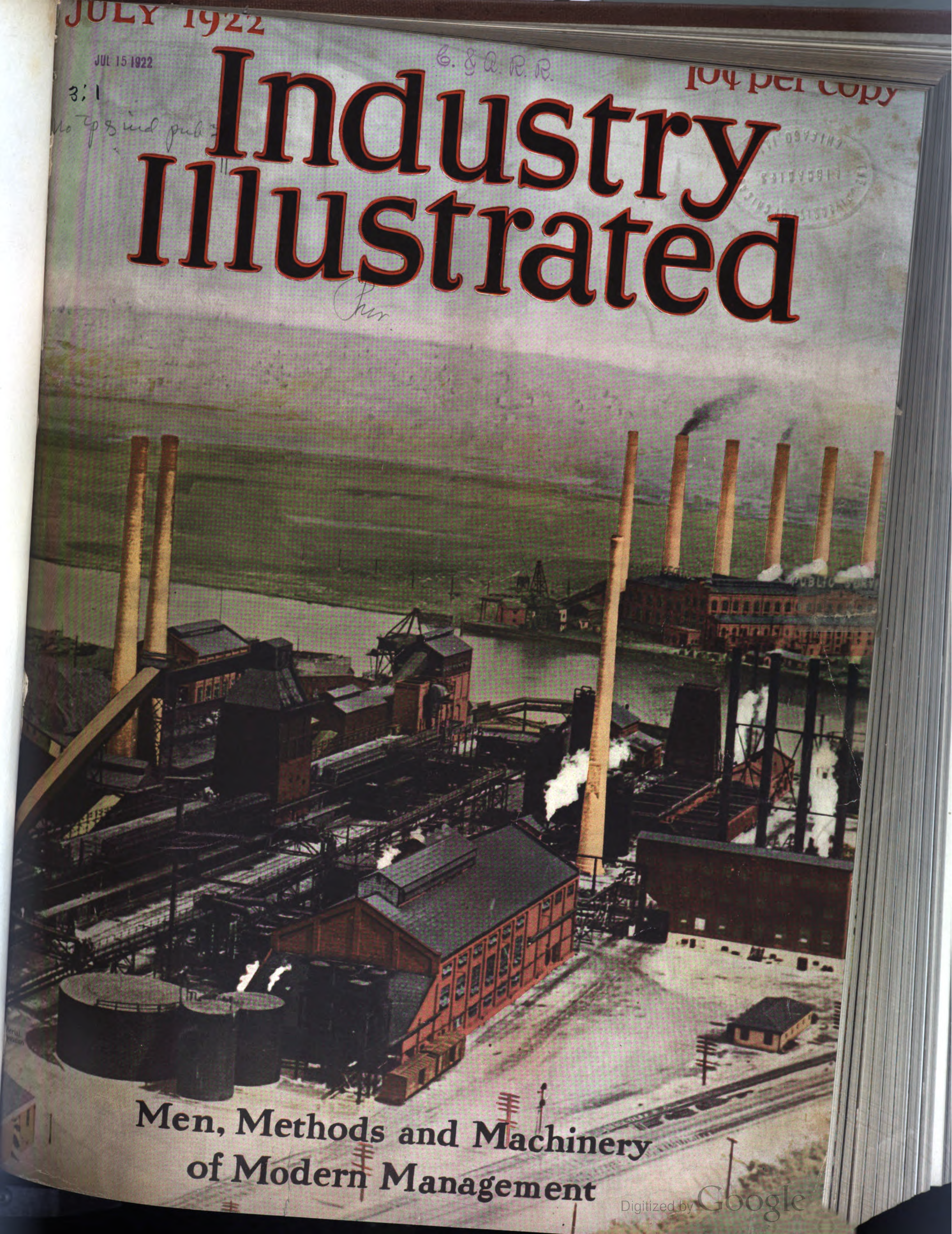
JULY 1922

JUL 15 1922

C. & A. R. R.

10¢ per copy

Industry Illustrated



Men, Methods and Machinery of Modern Management

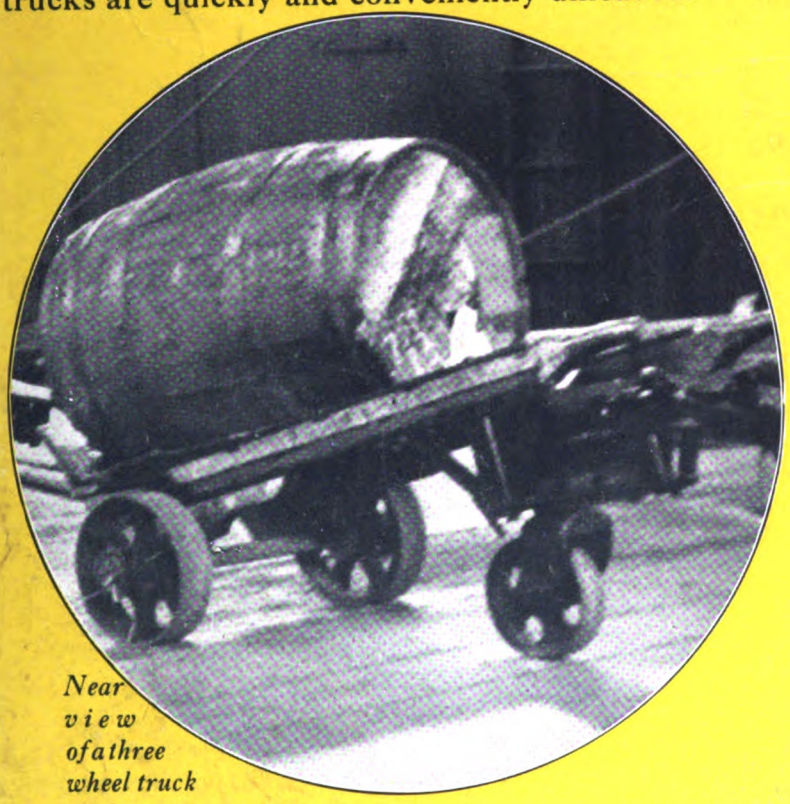
Digitized by Google

Economical Handling of Barrels and Drums

Cedar Hill Terminal of New York, New Haven & Hartford Uses a New Type of Truck Built by Lansing Company and Completely Hyatt Bearing Equipped

For the economical handling of barrels and drums the New York, New Haven & Hartford Railroad is using a new type of three wheel truck evolved by the Lansing Company. This is a two wheel truck with a caster wheel between the handles.

The new three wheel truck is loaded just as any two wheel truck, and is then dropped until the caster wheel rests on the floor. The loaded trucks coupled together form a train of trailers that is rapidly hauled by a tractor. Arriving at their destination the trucks are quickly and conveniently unloaded.

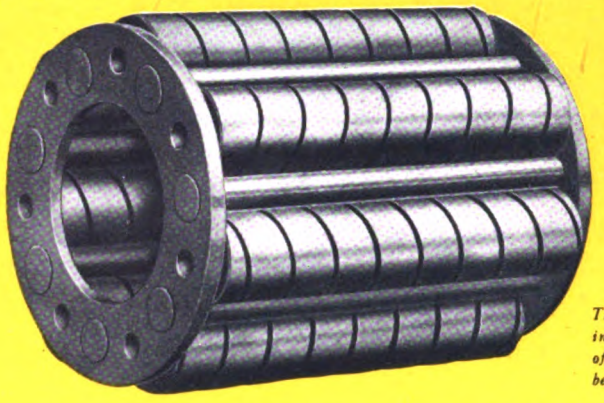


Near view of a three wheel truck

The new trucks are equipped throughout with Hyatt roller bearings, making them easy to move either by hand or as trailers and insuring their dependable operation for years without necessity of bearing adjustments or replacements.

Whatever improvements are contemplated in your trucking systems it will pay you to give careful consideration to the bearings. The use of Hyatt roller bearings makes possible material handling at the lowest cost per ton because of their easy running, their lubrication saving and their durability.

The rollers of the Hyatt bearing provide a true rolling motion in place of the rubbing friction of plain bearings, so that one man can handle twice as heavily loaded trucks without extra exertion and tractors can pull more trailers per train.



The easy rolling element of the Hyatt bearing.

The bearings are enclosed in the wheel hubs, providing a space for lubricant which need be replenished only three or four times a year—a real saving in oil and labor.

The tough, resilient steel rollers are designed to operate correctly without appreciable wear even after years of hardest service.

Whatever type or make of trucks you are using, these advantages can be secured by specifying that they be Hyatt equipped. Practically all representative truck manufacturers are in a position to furnish their trucks equipped with Hyatt roller bearings.

Hyatt Roller Bearing Co., New York, N. Y.

Industrial Bearings Division

Motor Bearings Division, Detroit
Tractor Bearings Division, Chicago

USE HYATT BEARINGS ON YOUR LINE SHAFTS TOO BULLETIN 127

Pacific Coast Division
San Francisco



This is the way they haul barrels at the Cedar Hill terminal of the New York, New Haven & Hartford on three wheel trucks equipped with Hyatt roller bearings and made by the Lansing Company.

Digitized by Google

790697

INDUSTRY ILLUSTRATED

CONTENTS

July, 1922

Editorial—Inventions and Progress Page 7

Lights of the Dim Past 8
By H. H. Manchester.

The Making of a Filament Lamp 10
By J. M. Hickerson—Quantity Production Methods that Have Brought Edison's Invention Within the Reach of All.

Wages and Wage Cuts 14
By W. H. Holmes—Some Dramatized Common Sense.

The Ever Widening Field of the Typewriter 17
An Interview with *Wellington P. Kidder.*

Coal Buying and Burning for Industrial Power 18
By Browning Robinson.

Modern Stock Keeping 22
By R. M. Nicholson.

The Future of Electrical Engineering 23
By Benjamin F. Bailey, Ph. D.

Getting at Facts About O r Machine Tools 24
By Felix J. Koch.

Published Monthly at Cooperstown, N. Y., by
THE ENGINEERING MAGAZINE CO.,
Founded 1891 by
JOHN R. DUNLAP
Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — WALTER IVES, *Vice-President* — RUTLEDGE BERMINGHAM, *Vice-President* — JOHN R. DUNLAP, JR., *Secretary-Treasurer*

Vol. 3, No. 1. Subscription price $1.00 per year; single copies 10 cents.

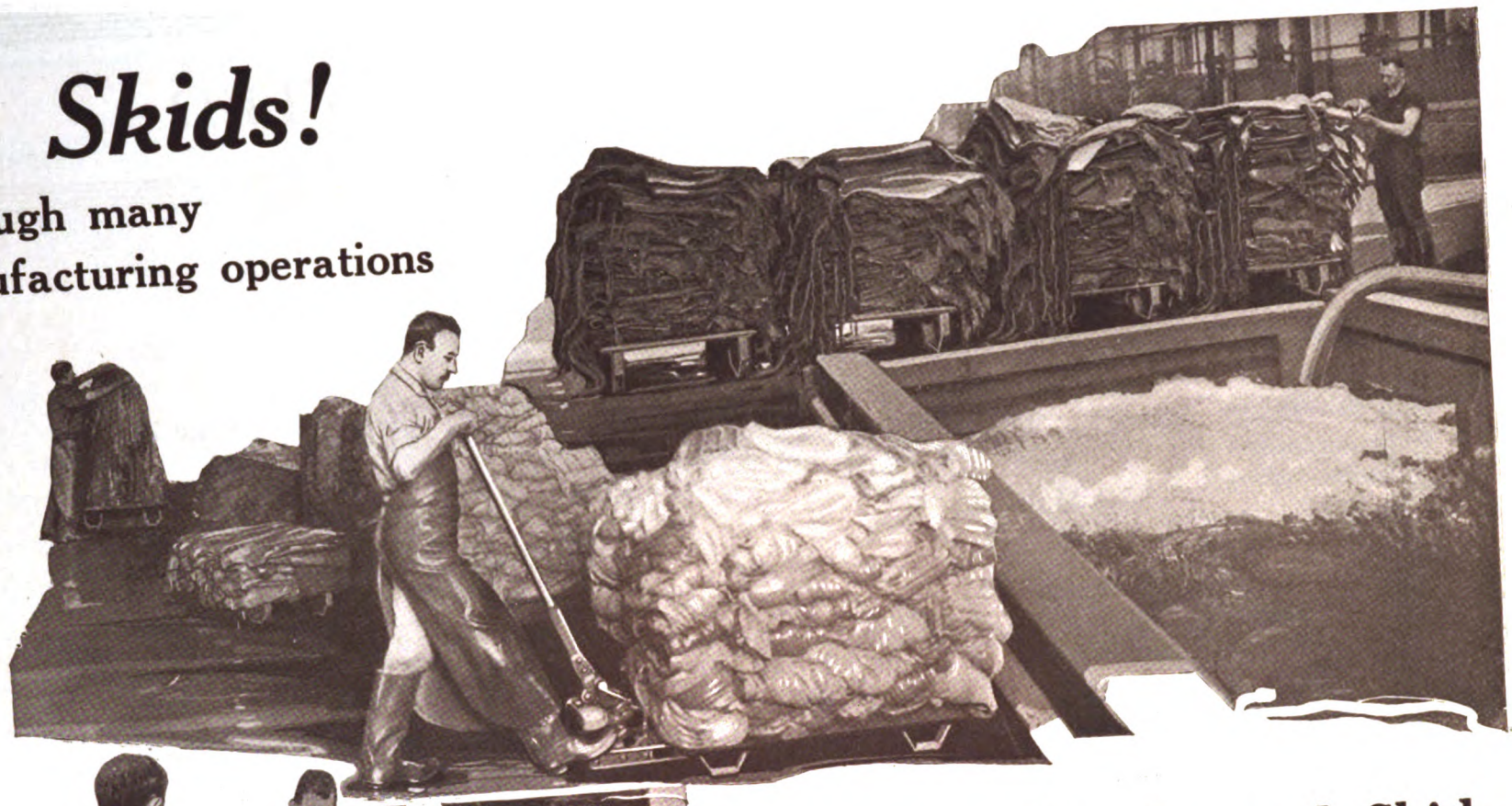
Copyright, 1922, by The Engineering Magazine Co., in both the United States and Great Britain.
Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

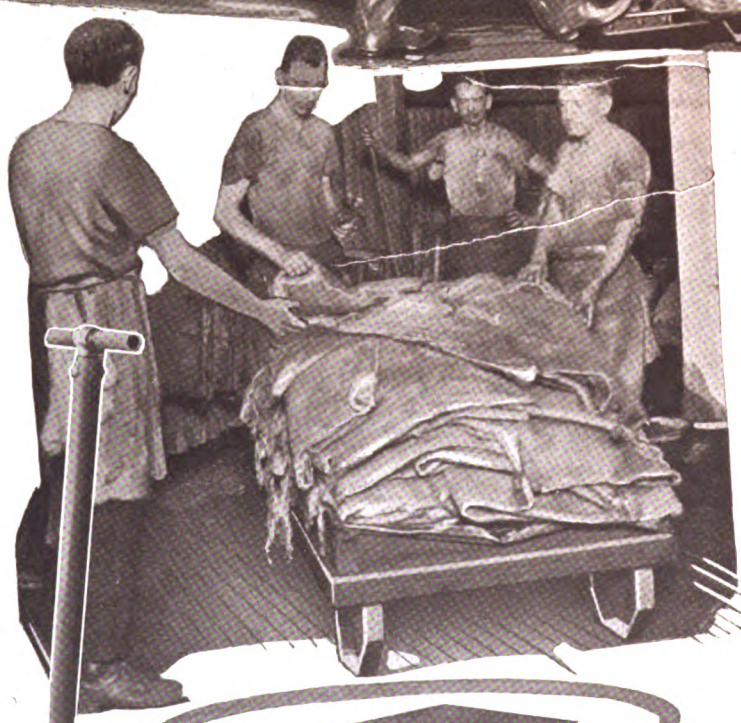


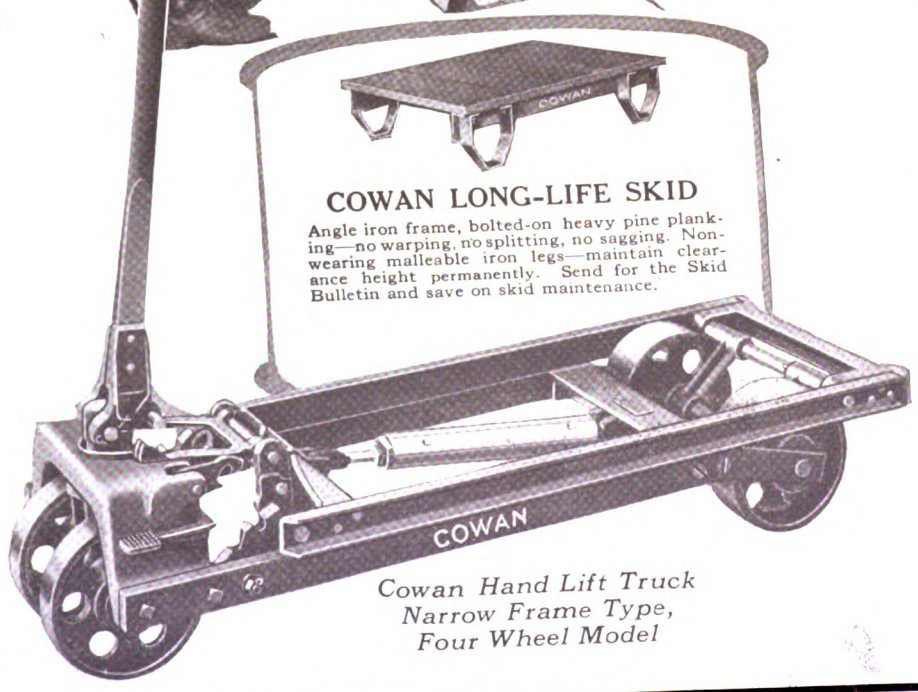
Digitized by Google

On Skids!

Through many manufacturing operations







COWAN LONG-LIFE SKID

Angle iron frame, bolted-on heavy pine planking—no warping, no splitting, no sagging. Non-wearing malleable iron legs—maintain clearance height permanently. Send for the Skid Bulletin and save on skid maintenance.

Cowan Hand Lift Truck
Narrow Frame Type,
Four Wheel Model

Cowan Trucks and Skids Cut Handling Costs

In the big factory of the Max Hertz Leather Co., Newark, N. J., superfluous labor costs are cut by skidding the loads whenever possible, thereby largely eliminating rehandling and ensuring easy, rapid transportation by hand lift trucks.

All the way through—from tanning vats to drying room—the hides move, on inexpensive skids. Through special machines they pass, off of one skid, then directly on to another. Practically no loading and unloading at each transfer. No large equipment of costly platform trucks. Inexpensive skids and a few hand lift trucks replace them. Cowan Hand Lift Trucks—one man hauling and automatically lifting and depositing loads weighing hundreds of pounds—are extensively used to handle these heavy burdens, reeking with vat liquors.

The Hertz Company is a large and experienced user of lift trucks and skids—they know the system pays. A skid and lift truck system, time and labor saving in operation, economical in first cost and maintenance, may mean even bigger cost cutting in handling your goods.

We shall be glad to send a Bulletin now and arrange for a study of your plant conditions at your convenience.

Cowan Truck Co., 6 Water St., Holyoke, Mass.

New York Office: Grand Central Palace

Offices in Principal Cities

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

Digitized by Google

"I took this chance and Won!"

"Jim, old man, how did you ever put it over?" It was after business hours, and Perkins---who asked the question---had stepped into the office of the newly appointed General Manager for a talk.

Perkins was sore. Until recently, both Edmonds and he had been Department Managers for the J. J. Black Manufacturing Company. But something had happened during the week just past to change all this. The former General Manager unexpectedly resigned. The Board of Directors met to appoint a successor. Edmonds got the job.

Perkins was stunned. Not because he had expected to get the position himself, but because he didn't see why Edmonds had landed it. He was frankly curious.

"Jim, old man, how did you ever put it over?"

Getting Out of a Rut

And then Edmonds told him. "Perkins, you and I were both doing the same kind of work. We knew our respective departments pretty thoroughly, but right there our knowledge stopped. We were strictly "one department men," and as such, our value to the Company was limited.

"We both worked pretty hard but we didn't seem to get ahead. We seemed to have found our level —it was just high enough to keep us from becoming discontented.

"But one year ago I woke up. An advertisement did the trick. It was a Home Study Course Advertisement—but not the usual kind. This advertisement offered me a Course of Study in Industrial Engineering and Factory Management. As a Factory trained man it appealed to me at once as an intensely practical course. It told me in plain fashion what I wanted to know.

A New Kind of Training

"I saw a chance to train myself, during my spare time, in the fundamentals of big business—a chance to study the basic principles which govern factory organization and administration, the selection and layout of buildings and equipment, the planning and routing of work, wage systems and bonus plans, cost accounting, the generation and use of power, the valuation of property, statistical control and all other factors which are conducive to maximum production at minimum expense.

"I acted then and there. I took this chance and won."

Thousands of factory trained men, among whom are presidents, general managers, superintendents, industrial engineers, foremen, cost clerks, accountants, storekeepers, inspectors and plain, every day workers at the bench have seized the same opportunity which came to Edmonds, and have been helped to bigger jobs and better salaries by enrolling in the "Factory Management Course and Service" offered by the Industrial Extension Institute.

An Organized Course of Study

This remarkable course is the only one of its kind in the world. It is a practical, non-technical course for the practical factory man. It is based on the University plan of organized study, consisting of lectures, talks, reading assignments, text books, problems and model solutions to these problems. The Consulting service, which is part of the Course, is intended to help you meet and solve the questions which arise in your daily business.

No University has been able to present a Course like this one. It would be impossible to hire as teachers the sixty prominent industrial specialists who have personally cooperated to produce the Factory Management Course and Service. The combined experience of men like Gantt, Towne, Babson, Ficker, Steinmetz, Franklin, Going etc., each a recognized expert in his own particular field—has been systematically arranged and presented in plain, understandable language so that you can profit by it.

You will understand what men at the top think about the "Factory Management Course and Service" when we tell you that 35 per cent of the last 1000 men to enroll were managing executives. This does not include any man below the position of superintendent.

Wanted—The $20,000 Man

The demand for men trained in industrial management is far greater than the supply. Big business is literally begging for the man who can hold down a $20,000 job.

Show your will power! Make up your mind to get out of the rut of routine and begin *now* to prepare yourself for a bigger, broader job.

The man who studies this course conscientiously will quickly qualify for greater responsibilities, and, what is much more important, he will find his qualifications recognized and the responsibilities thrust upon him.

You have read this advertisement. Now take the chance it offers you. Tear off the coupon below and send for:

"Thinking Beyond Your Job"

—the interesting 100 page booklet that tells you, without any obligation on your part, everything you want to know about the Factory Management Course and Service.

INDUSTRIAL EXTENSION INSTITUTE
9 East 45th Street, New York City

Gentlemen:—

Send me without obligation your 100 Page Book "Thinking Beyond Your Job."

Name .....

Home Address .....

Position .....

Company .....

Co. Address .....

Ind. Ill. July, 1922

231910

Digitized by Google

PUT ENERGY AND EFFICIENCY in your heating system, with the economical JENNINGS HYTOR

Now is the time to prepare your heating facilities to meet the conditions of the coming winter.

The installation of a Jennings Return Line Pump in connection with your system means quick heat in the morning, at the most isolated radiators, and in zero weather. It means a positive control of heat at all times and the elimination of radiator noises. It means an economy in fuel, that, according to our customers, makes this piece of equipment a real dividend paying proposition.

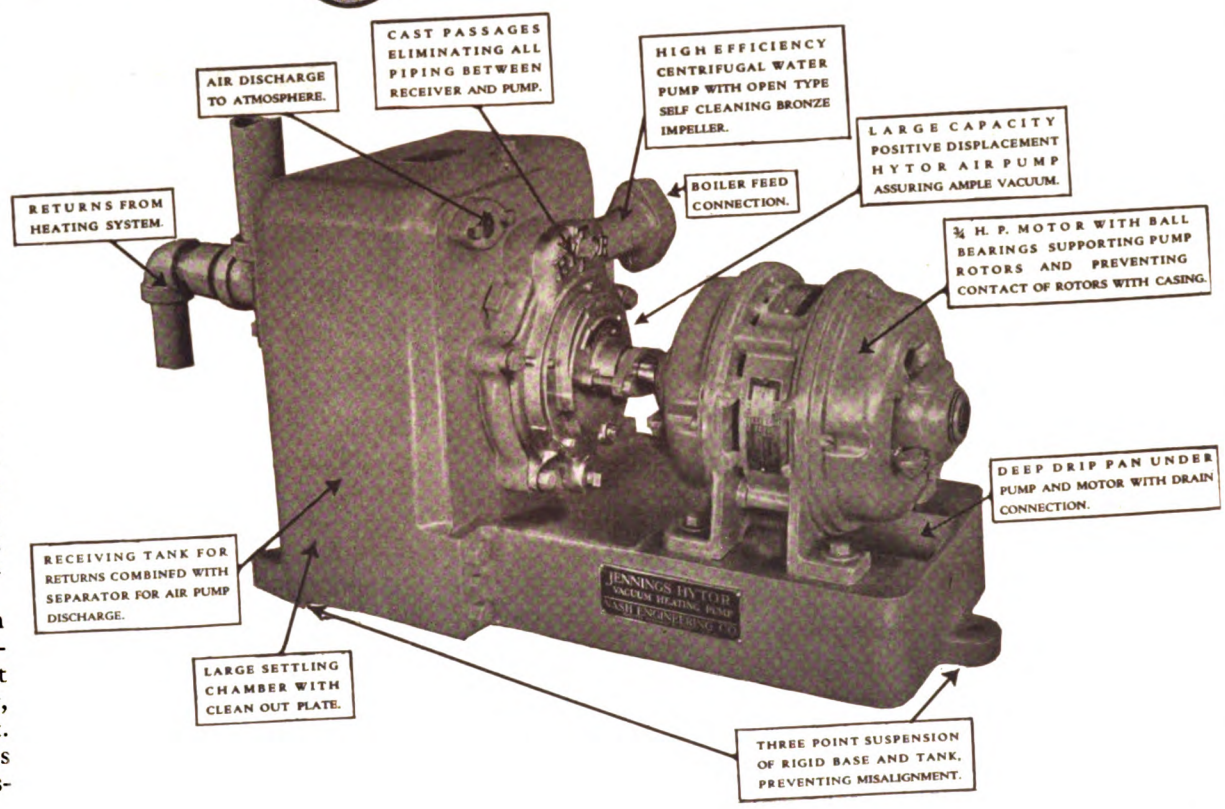
Jennings Pumps are made for any size installation. The small unit here illustrated has ample capacity of 5,000 sq. ft. of equivalent direct radiation. Because of simplified design, in connection with quantity production, this outfit is being sold at a price never before possible in a pump of this capacity.

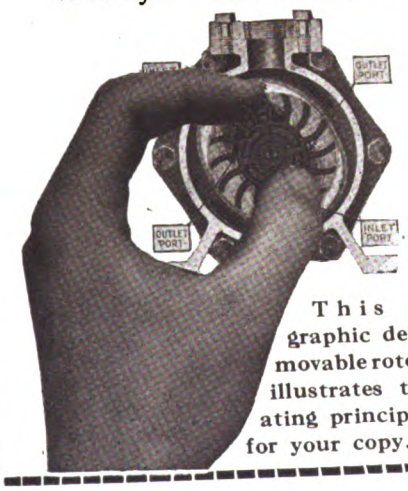
The pump incorporates all of the high grade workmanship and material characteristic of our Jennings equipment. It is equipped with solid bronze air rotor, rotor housing, water impeller and shaft.

In this unit all piping complications have been removed, and it is only necessary to make three connections:

1. The return main.
2. The water discharge.
3. The air discharge.

Write for Bulletin and Prices





This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

4

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ **Return Line Heating Pumps**
- ☐ **Boiler Feed Pumps**
- ☐ **Hytor Air Compressors**
- ☐ **Hytor Vacuum Pumps**

NAME.....

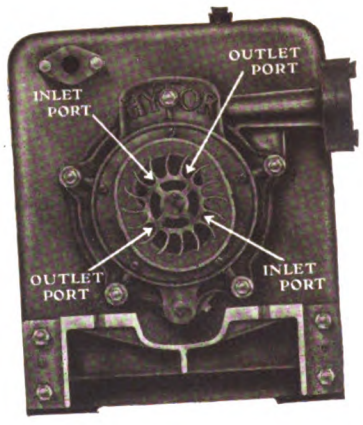
POSITION.....

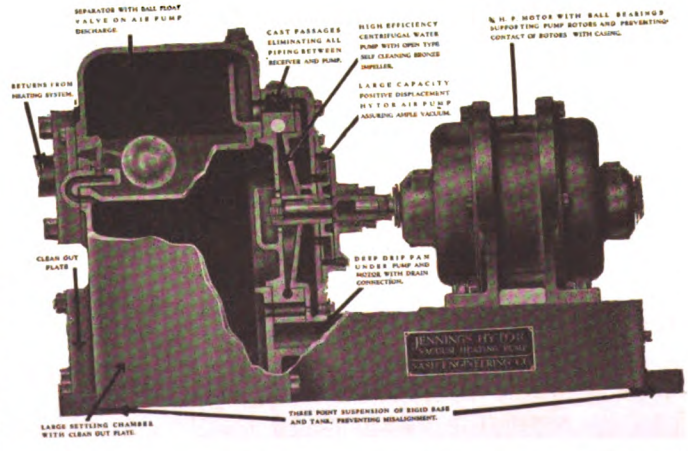
COMPANY.....

ADDRESS.....

The air capacity is 3 cubic feet per minute, measured at 10" of mercury vacuum. The pump at the same time handles 8 gallons of water per minute from a vacuum of 10" of mercury against 10 lbs. gauge pressure at the pump. Under these conditions the pump requires ¾ h.p. motor.

In this pump a positive displacement vacuum pump with high efficiency exhausts air only, while the centrifugal pump element handles only the condensate. In thus separately handling air and water in a predetermined ratio, such high efficiency is effected that no other pump can be secured of equal capacity for similar service with the same minimum horse power requirements.





While the new compact "M" type is furnished in one size, our well known Jennings Pumps in separate tank design, as recommended for larger capacities, are furnished for any size installation.

Many thousands of these pumps have been installed and have given universal satisfaction.

An important feature of these pumps is the very large air volume, as compared with their capacity rating, which assures ample vacuum.

As the horse power required is considerable less than for any other pump in the market of the same *rating*, regardless of the actual *volume*, the result is very low electric current cost. This, coupled with the extreme durability of these units, make them the most economical return line heating pump it is possible to install.

NASH ENGINEERING CO.
SO. NORWALK, CONN. U. S. A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

Inventions and Progress

IN the city of Strassbourg is a world-famous clock which not only tells the time of day, but presents a procession of life-size figures of the Apostles, gives the seasons, phases of the moon, and a number of other interesting things. This clock, as it stands today, was re-constructed in 1842. It was originally designed and built, however, by a mathematician named Conrad Dasypodius in the year 1574.

Legend has it that when this wonderful clock was completed, the City Fathers of that time were not only struck by the marvellous creation, but they were possessed of a jealous fear that some other city might one day obtain another like it. So they destroyed the eyesight of Dasypodius, that he might never construct another such clock.

We are told, further, that a short while afterward something went wrong with the clock. They appealed to the blind inventor, who assured them that, even without his sight, he could repair his beloved mechanism. They led him there, and he, with a sense of poetic justice, managed so to disarrange the mechanism that it ceased to function at all. And it was more than two hundred and fifty years before a genius could be found equal to the task of repairing the damage.

In all Europe during that time there were probably not a handful of men who could have studied that mechanism intelligently enough to restore it. Travel and means of communication were slow. The artisan in Holland or Germany would learn of new discoveries or developments in places a few hundred miles away only many months after they had taken place. Education was for the very few; books were rare and costly. The great mass of the people could neither read nor write, and had no opportunity to familiarize themselves with inventions.

We call the present the age of machinery or the age of invention. We marvel at the intricate and wonderful creations the mind of man has conceived and brought into being. Figuratively speaking, we pat ourselves on the back for being so far ahead of those old fellows of centuries ago; those generations of men who failed to see the germ of a tremendous idea in Hero's turbine; who did not appreciate the value of machinery, and let so many inventions die for lack of that appreciation.

Yet, with our infinitely higher standard of mass education, with our infinitely better opportunities for gaining specialized knowledge, and with our infinitely quicker means of travel and communication, the wonder lies not in these things themselves, but in the fact that so many of us fail to take advantage of them.

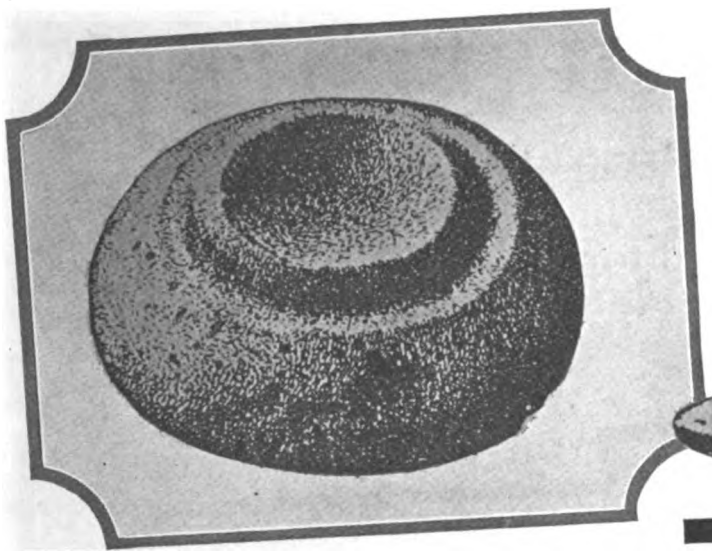
Knowing that machinery is superior in every way to man-power for the heavy work of the world, we still go on wasting men and money through antiquated methods. Knowing that coal contains products many times more valuable than its mere heat as a fuel, we continue to burn up these products as fuel.

We expect much of our inventors. Doubtless the next decade will see some revolutionary inventions. But what we need is not so much new inventions and discoveries. What is needed is a better and more universal use of those already at hand.

Digitized by Google

Lights of the

By H. H.



A stone lamp probably twenty thousand years old.



A sand-stone lamp estimated to be fifteen thousand years old.

AT THE opening of the present century when the discoveries of prehistoric caves in Northern Spain and Southern France followed one upon another, it was found that even the inmost recesses of winding and complicated caverns were decorated with paintings of animals, several of which are now extinct. The question at once arises, what light did the cave dwellers use to enable them to do this painting?

At first it was supposed that they had only firebrands, or dried wood, or rushes, and no doubt they did employ these materials. But one by one hollowed stones were discovered, which it was seen might have been used to hold fat to be burned as a light. At last one was unearthed in the cave of La Mouthe which still contains traces of ashes adhering to it, which on a chemical analysis proved to be like those from the burning of animal fat, such as lard or tallow, that had not previously been separated from its membranes. The consensus of opinion is that this must have been the lamp of the time.

As these caves belong to the glacial period, some twenty thousand years ago, the stone lamp was in existence at that almost unbelievably distant date. It was used in the epoch



Ancient Egyptian lantern, from three to four thousand years old.



The ancient Egyptian lamp with two bowls connected by a tube; used in worship.

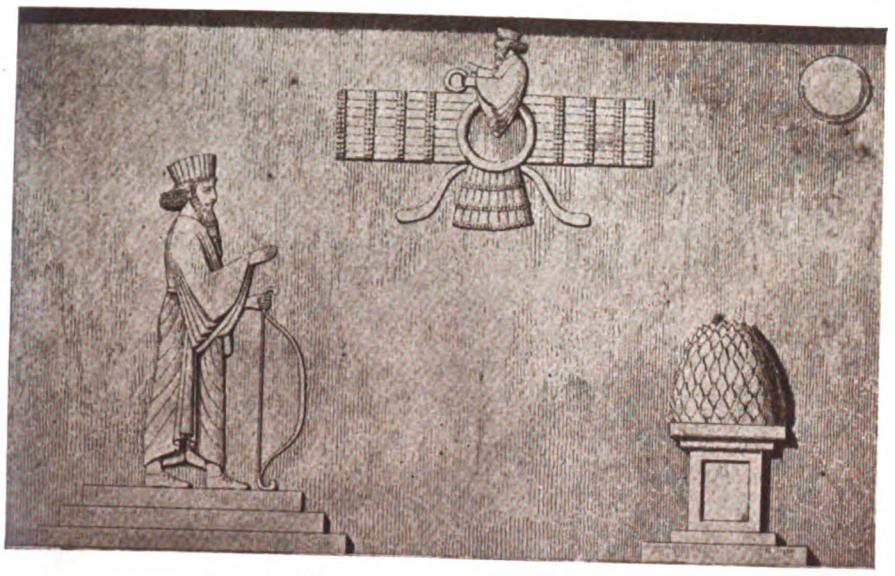


The Seven-Pronged Candelabra of the Jews.
(See text.)

Digitized by Google

Dim Past

MANCHESTER



The Persian fire altar, used with the eternal fires, at Baku.

of the sabre-toothed tiger, of the mammoth, and cave bear, when the reindeer herded on the edge of the ice field in Spain. It is older than agriculture, or bread making, or pottery, or weaving. Its importance to that time was no doubt increased by the very fact that the race dwelt in caves. Perhaps it made possible the production of the wall frescoes, the astonishing discovery of which has created an epoch in our knowledge of the past.

Some of the stone lamps of that age were like small, shallow bowls, a few of which have a hollowed ring around the rim. In other cases they are not much more than nodules of stone with a hollow rubbed out of one side.

Perhaps an attempt at an improvement may be seen in a sandstone lamp, one side of which is fashioned to a point, which gives the impression of an uncovered spout.

The fuel, as we have intimated, was no doubt the fat from the animals or even the fish of the period, for vegetable oils were not yet obtainable in that cold climate, and mineral oils were of course unknown. Even this crude lamp was probably a great improvement over the firebrand for use inside the cave, as it produced less smoke, and the fuel was more concentrated.

Whether a wick was used is

(Continued on Page 46)



Lamps of the Ancient Assyrians.



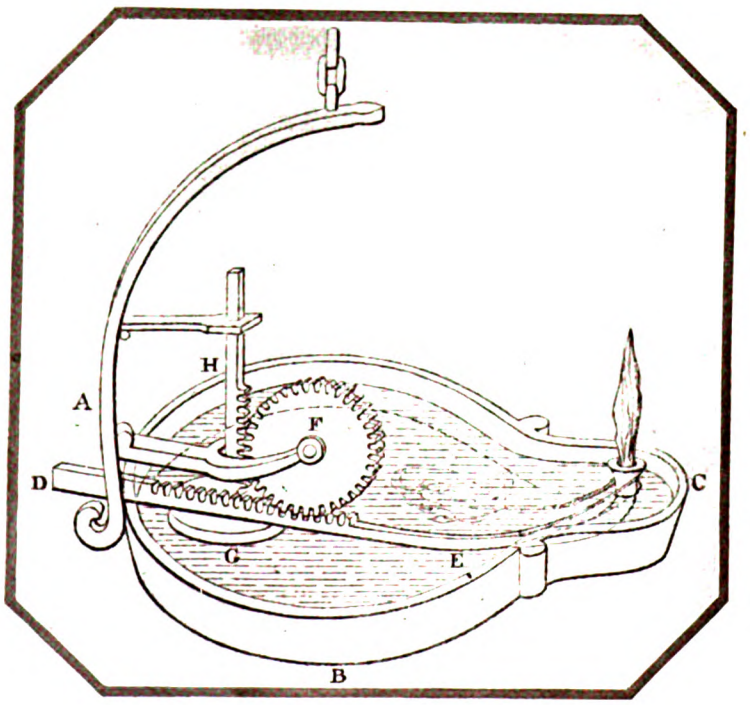
Greek lamp-protectors, 2400 years old.



The earliest known illustration of a candle, from an Etruscan sarcophagus, about 700 B. C.



Some Pompeian Candelabra, giving evidence of more elaborate design.



Our friend Hero, the geometer, who designed a steam turbine, also designed this self-regulating lamp and wick—about nineteen hundred years ago, perhaps more.

Digitized by Google

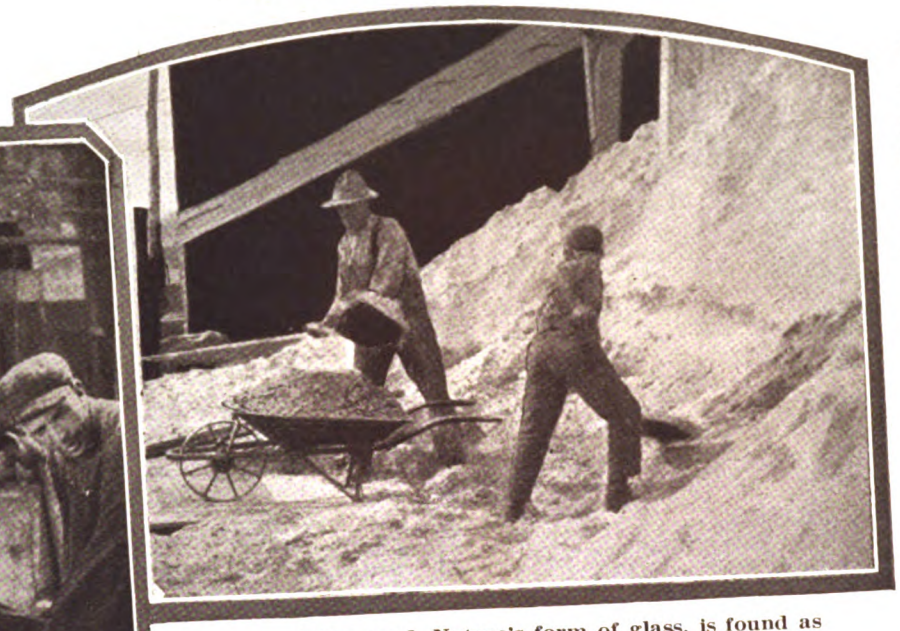
The Making of a Filament Lamp

Quantity Production Methods That Have Brought Edison's Invention Within the Reach of All

By J. M. Hickerson



At the glass factory the glass-to-be is melted in clay pots at a temperature of 2500 degrees F. Making these clay pots is in itself a tedious and expensive operation.

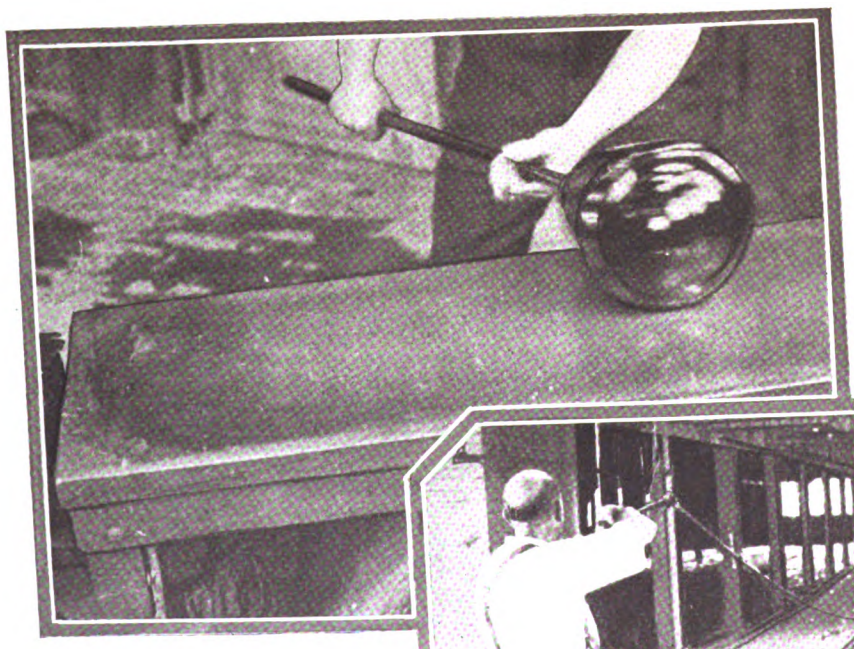


Silica sand, Nature's form of glass, is found as soft sandstone. It is crushed and pulverized at the quarry and then shipped to the glass factory to be washed and mixed with other ingredients to make various lamp parts.

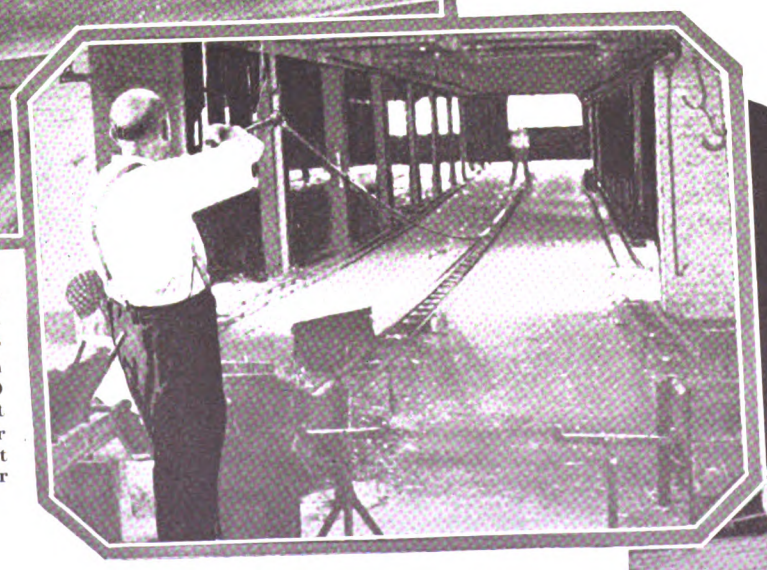
NO ONE knows when in past ages some savage discovered fire and use a flaming torch to light his cave when twilight fell. Coming down to recent times, however, gas was widely used for illumination purposes in the eighteenth century, and was known to men of science several centuries earlier. But it was not until the close of the nineteenth century that the period of safety, reliability, convenience and economy in artificial illumination was ushered in with the commercial development of the incandescent electric lamp.

Distant India, Spain and the Malay Peninsula furnish some of the ingredients of incandescent lamp parts; others come from Greenland, Canada, Chile and a dozen or more of the United States; and yet others are taken from the air. These thirty-odd materials go through many processes in the manufacture of glass, wire, and brass bases, which are the three major parts of a tungsten filament incandescent lamp.

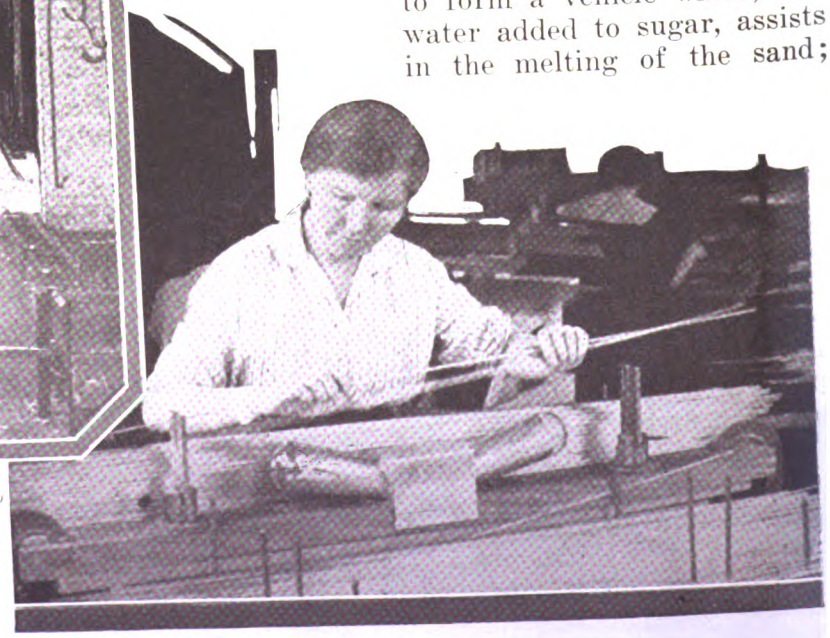
Nature's form of glass is silica sand which is found in the form of soft sandstone. This is quarried, crushed and pulverized, and shipped to the glass factory as fine sand. At the factory certain ingredients are added to this sand—some to form a vehicle which, like water added to sugar, assists in the melting of the sand;



The molten glass is removed from the clay pots on the blow pipe and is rolled on a "marvering plate" to properly distribute it about the end of the blow pipe. Then it is blown and drawn into hollow tubing for use in lamp making.



At the right—Glass blower and helper drawing tubing. The sphere of molten glass shown above is here drawn into the hollow tube from 150 to 200 feet long in No. 4. It cools on an endless roller which automatically cuts it into lengths convenient for handling.

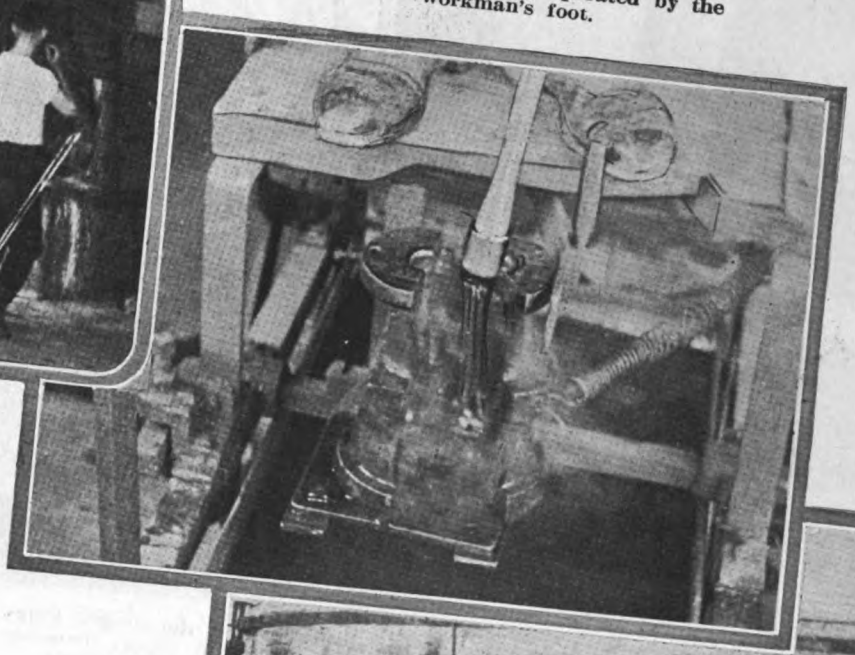


At the right—Inspecting tubing for flaws and sorting it as to the outside diameter and thickness of wall.

Digitized by Google



Blowing bulbs for incandescent lamps. Lamp bulbs are blown like soap bubbles, but the "bubble" is surrounded by a mold to give it the desired shape.



Below—Close-up view of mold in bulb blowing process. The mold is opened and closed by a lever operated by the workman's foot.



General view of blowing room. Each workman has a bulb rack in front of him.

others to produce clear and colorless glass.

These raw materials are carefully weighed, thoroughly mixed, and fused in great clay pots. These pots are made of a special kind of clay and require five weeks to construct. Then, after the pots are completed, several months of "seasoning" are necessary before they are dry enough to use. The pots and their three-fourth ton contents of glass-to-be are kept at a temperature of 2500 degrees Fahrenheit, day in and day out. Worn-out pots are replaced with the furnace operating at full temperature.

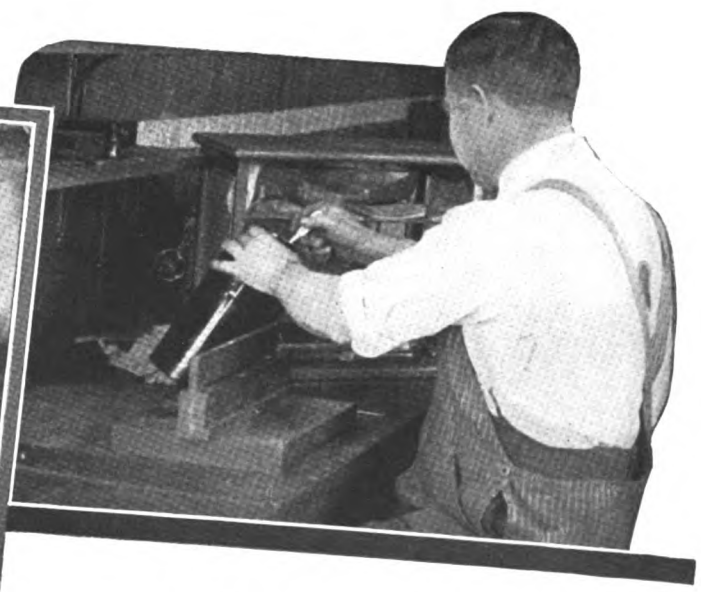
After twenty hours of heating the glass is ready for working. A large ball of molten glass is gathered on a blow pipe and rolled on a "marvering plate" to distribute its mass properly about the end of the pipe. Then it is reheated to make up for the cooling in the previous process, and is pulled into a long hollow tube. Later it is cut into smaller



Inspecting the bulbs for streaks, air bubbles and other flaws.

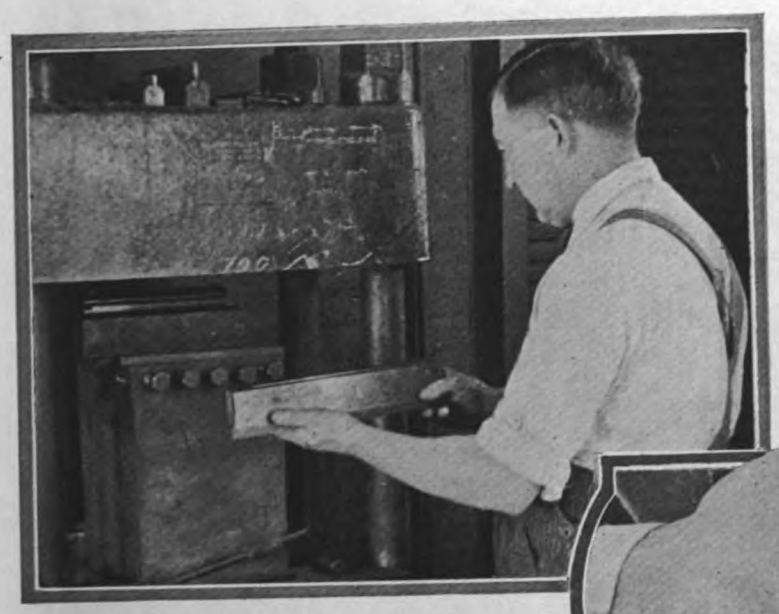


At the left—Placing the powdered tungsten in a grooved mold in which it is subjected to tremendous pressure.

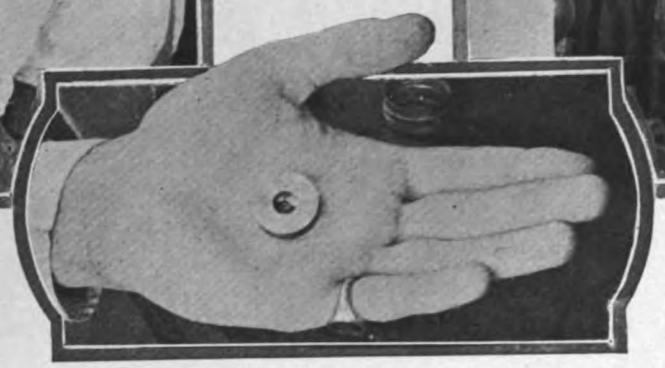


At the left—Accurately weighing powdered tungsten before it is pressed into tungsten ingots—one of the steps in making tungsten lamp filaments.

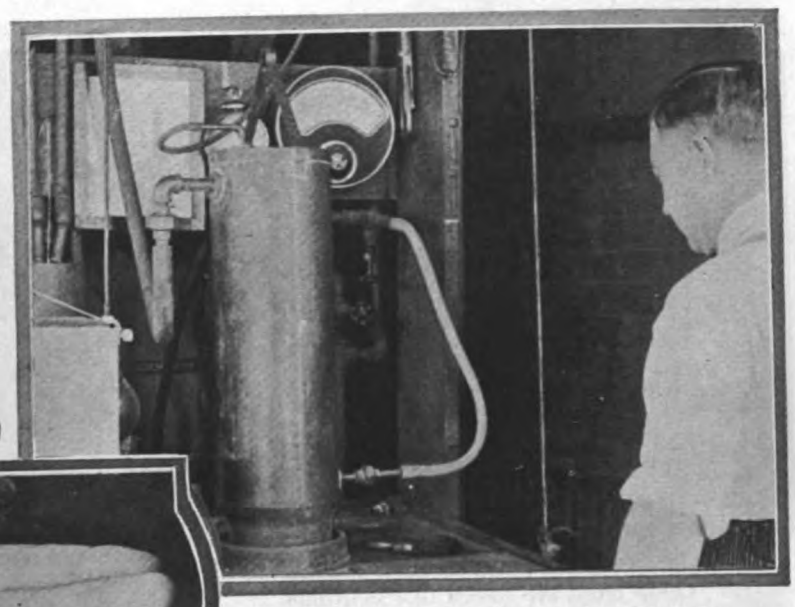
Digitized by Google



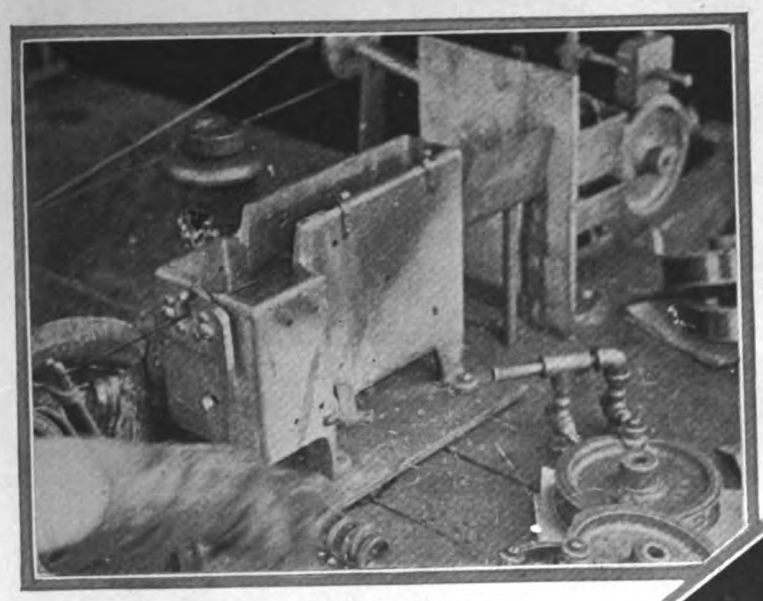
Placing mold, filled with powdered tungsten, in press.



Die through which the swaged tungsten is drawn to the proper diameter for lamps of various wattages.

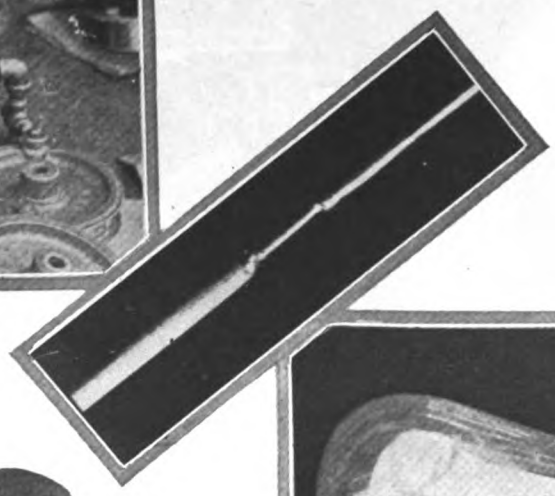


The tungsten ingot is heated in an electric furnace which welds the fine particles together into a solid mass. Later the ingot is placed in a "swaging" machine containing a pair of small hammers which pound the ingot on all sides thus toughening and elongating it.



Wire drawing machine fitted with die through which the tungsten wire for lamp filaments is being drawn.

Below—The "lead" wire in an incandescent lamp is of copper and nickel, except for a small portion known as the "press-lead" which passes through the glass and has the same expansion and contraction properties as glass.

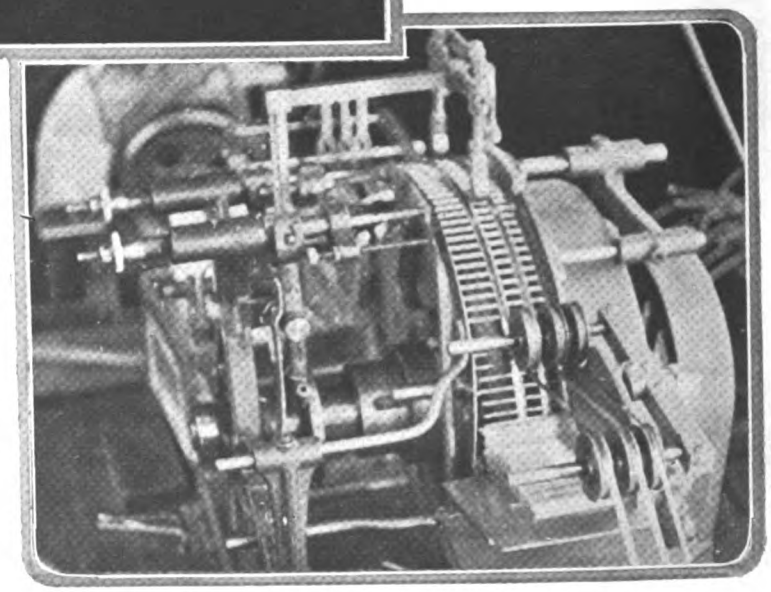




Cutting tubing for the stem which supports the filament of the lamp.



At the left—The bulb as it comes to the lamp factory has some superfluous glass which is left on to facilitate "sealing" and to protect the bulb from cracking.



At the right—A "button" machine. The button rod is fastened to the flanged tube.

lengths, inspected for flaws and sent to the lamp factory where it is cut into lamp sizes and flanged at one end to make "flanged tubing." This flange is later fastened to the base of the globe.

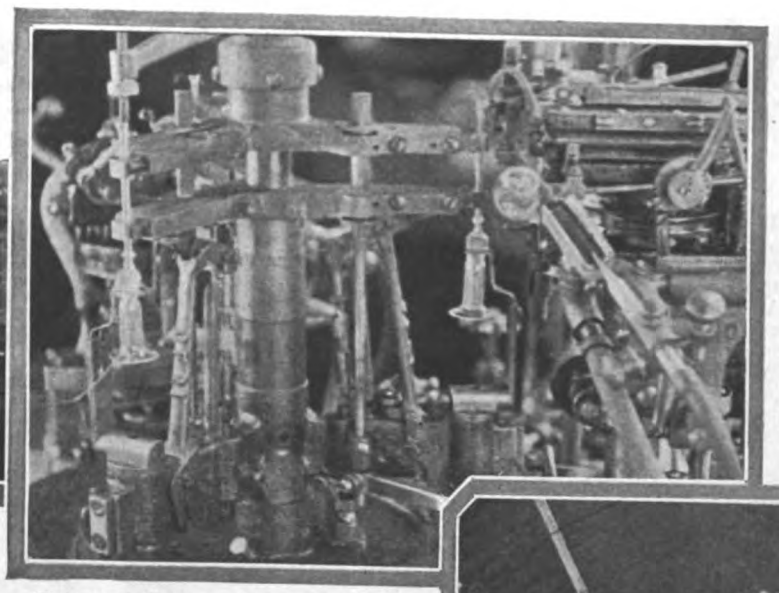
Cane glass, which also enters into lamp making, is drawn into solid rods in somewhat the same way as flanged tubing is made. At the lamp factory this glass is cut into lamp sizes and fused, together with the "lead" wires which carry the current into the lamp, to the unflanged end of the flanged tubing.

The third lamp part made in

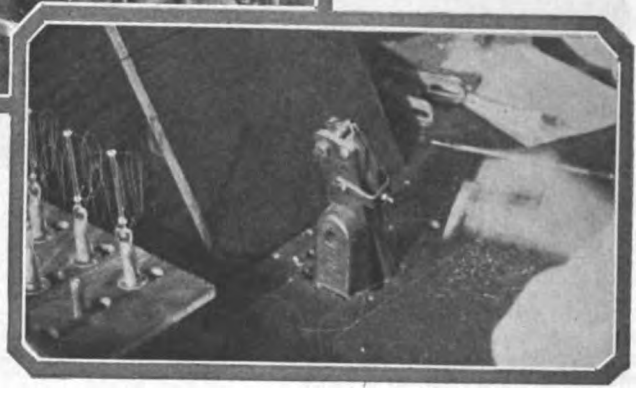
Digitized by Google



Assembling stems—flanged tubing, button rod and leading-in wires.



This complex machine puts the filament supports into the button rod.



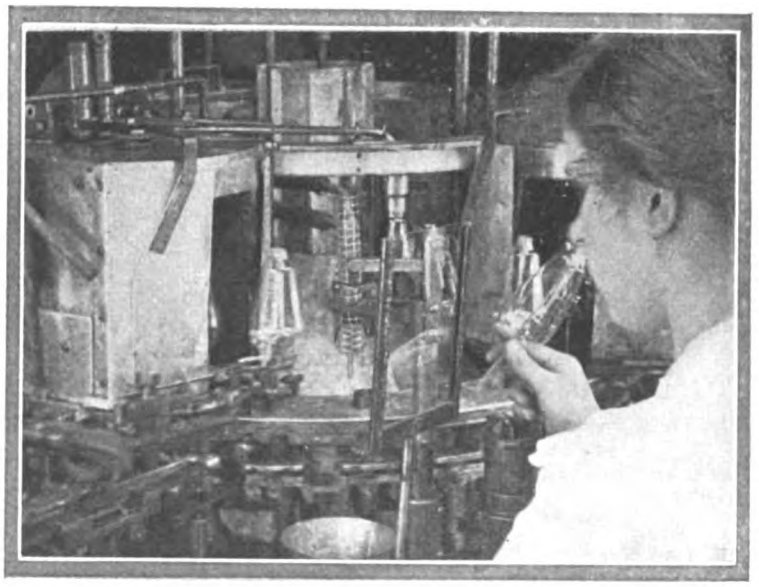
Winding tungsten filaments for vacuum type lamps.

the glass factory is the bulb. Lamp bulbs are blown like soap bubbles, but the "bubble" is surrounded by a mold to give it the desired shape. The mold is sprinkled with finely powdered cork and is moistened, which causes a cushion of steam to be formed between the hot glass and the moist cork lining. Rotating the blow pipe gives the bulb a smooth, polished surface. The blown bulbs are crated and sent to the lamp factory.

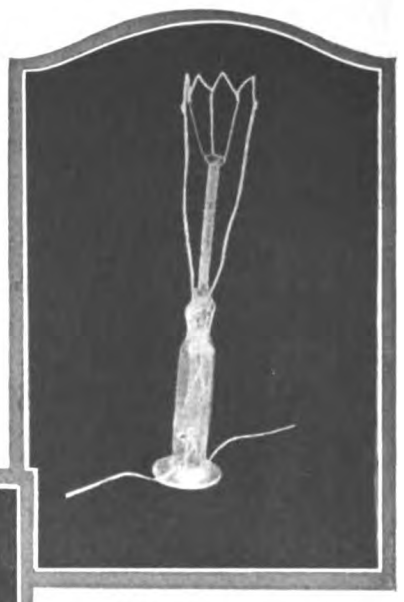
Incandescent lamp filaments are made of tungsten wire which has been refined from wolframite or sheelite ore. The various impurities are separated from the ore and the resulting tungsten concentrate is chemically treated and fired in electric furnaces until a pure metallic tungsten powder results.

This powder is placed in molds and pressed into ingots which have shape, but very little strength. The ingots are

(*Continued on Page 32*)

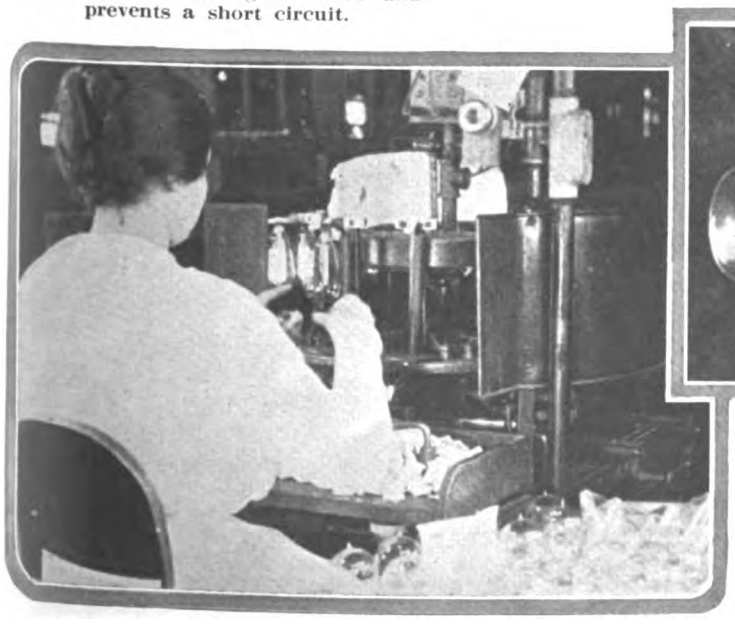


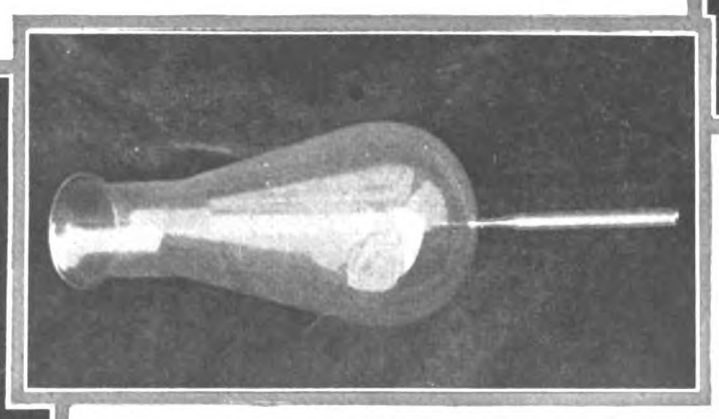
Above—This operation removes air from the lamp, and, in some types, substitutes an inert gas.



Filament mount for gas-filled lamps. Note the lead wires projecting from the flanged tube.

Below—Testing the un-based lamp for mechanical defects. A piece of cotton separates the leading-in wires and prevents a short circuit.





Before the filament mount is placed in the tube, a short piece of tubing, through which the air is removed later, is fused on the end of the bulb. When this tube is sealed off, the familiar lamp tip results.

Digitized by Google

Wages and Wage Cuts

BY W. H. HOLMES

In view of the interest expressed by many of our readers in a previous article by Mr. Holmes, we take pleasure in presenting the following brief biographical sketch.

W. H. Holmes left school at the age of fifteen and went to work as water-boy on a factory construction job. His 22 years' experience since then includes: bicycle-repairman; factory hand in sheet-metal shop, in oilcloth factory, stove factory, gun factory; laborer on subway, water-works and building construction; stevedore; lunch-room man; truck driver; railroad brakeman, switchman and signalman; machinist, tool-maker, and production hand.

Mr. Holmes is at present employed in a tool room of a manufacturing plant, and considers his writing as an avocation. His experience and viewpoint, coupled with a gift for dramatizing the every-day happenings in the worker's life, make Mr. Holmes' articles of importance to every executive who is interested in better teamwork through better understanding; especially as they are based strictly upon actual facts within the writer's experience.



The notice was scarcely on the board when the workmen were crowding around it.



Going to the kitchen shelf, his wife took down an account book. She jotted down a number of items, thinking long over each one.



It did not enter his mind that it was only the number of men given employment, which enabled the owner to live.

BEGINNING Monday, May 1, a ten per cent reduction in wages will go into effect. At present this will only apply to the production forces. Present conditions of the trade render the above action necessary."

The notice was scarcely on the board when the workmen were crowding around it.

"Stick by us, Boys, and we'll stick you!" snickered a happy-go-lucky youth, paraphrasing a war motto. He eyed the expressive faces of his companions. "Less money, less work," he added, voicing the usual immediate reaction to a notice of this type. "Come on, fellows, let's go! We'll reduce work twenty per cent!"

Jim Barlow, his mind disturbed, glanced at the youth. "It may be serving them right, Lew," he said shortly, "but it ain't paying my bills."

"Serves all of you right!" exclaimed a bystander exultantly. "You had a chance to get into the Union and walk out with us when we pulled the

Jim read what she had marked down: Rent—Coal—



Digitized by Google

"Do you expect me to keep house, pay bills, and raise three children on that money; with living what it is?"





"Why, we can't live on that!" said Jim, with a sinking feeling at the realization.



strike. You couldn't see it then. Now you're getting what's coming to you. Let's see you do something for yourself, now!''

In the meantime, the rest of the force, after talking over the notice, each taking it according to his vocal ability and necessities, most of them earnestly swearing to look up another job at the first opportunity, finally fell into their routine tasks. But vim was lacking, and they worked simply as the clock ticked. The clock's hands would eventually reach twelve o'clock and release. The tasks were performed with that end in view.

One of the men came to Jim's machine. ''Jim,'' he asked, ''if I put you wise to a good job will you go over there with me?''

''Where?'' asked Jim.

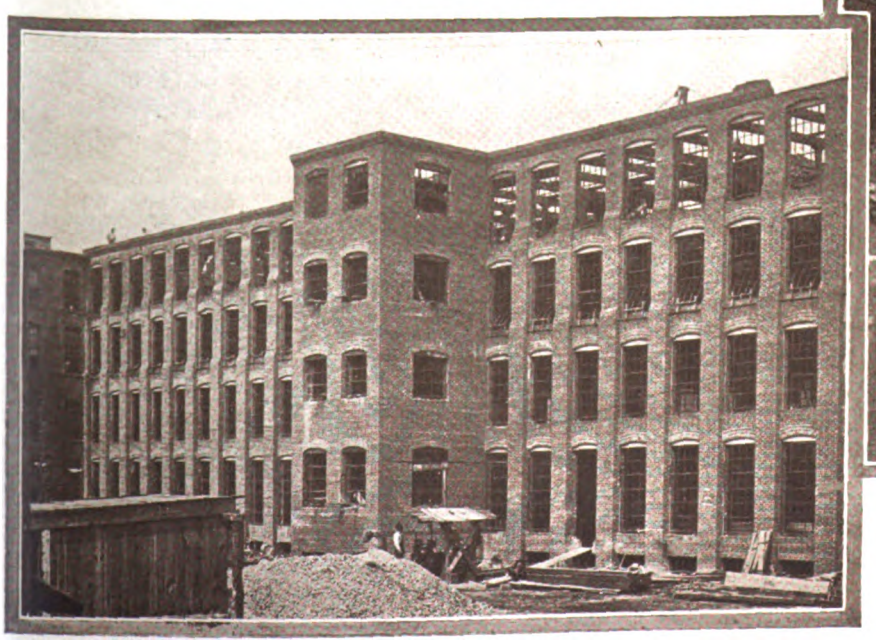
The disgruntled one named

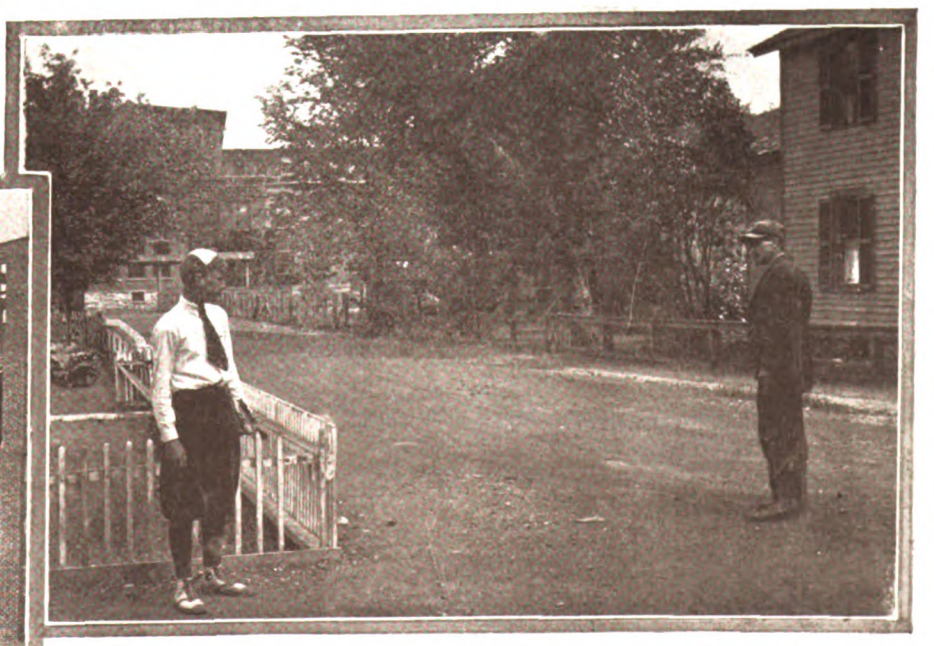


She gave an angry snarl at the children, who were drilling under the direction of the older boy.

'We'll always be living the same way. Nothing to look forward to but debts, poverty and a bare existence."

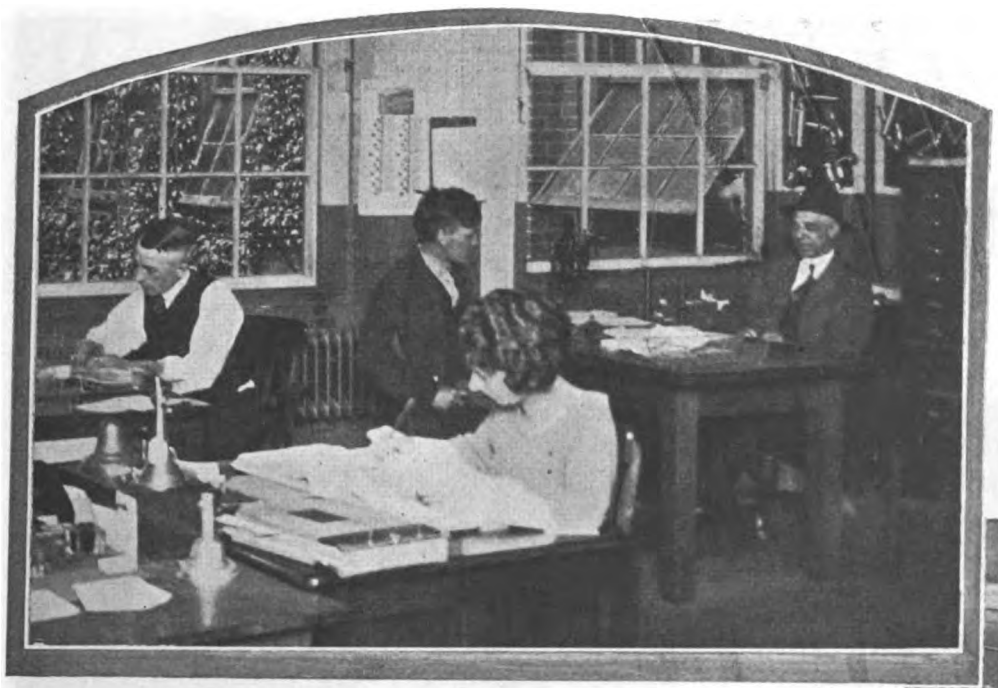
The manufacturer stood by the creation he had built up through the long, lean years.



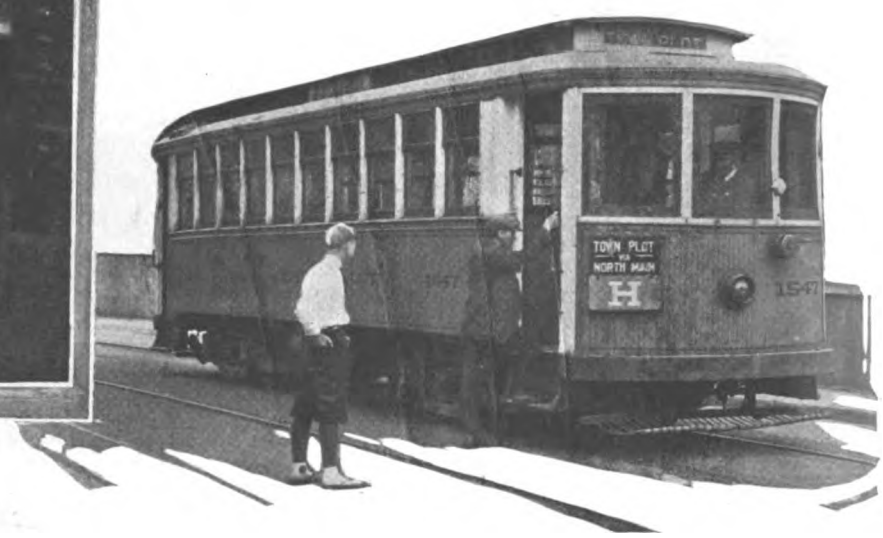


Depressed, Jim left the boy and turned toward the shop.

Digitized by Google



Back home was a sullen, discontented wife, unpaid bills, discord and worry. There was nothing for Jim to reason calmy about.



Bob saw his father off on the trolley; but Jim's mind was on his problems.

a shop at the far end of the town.

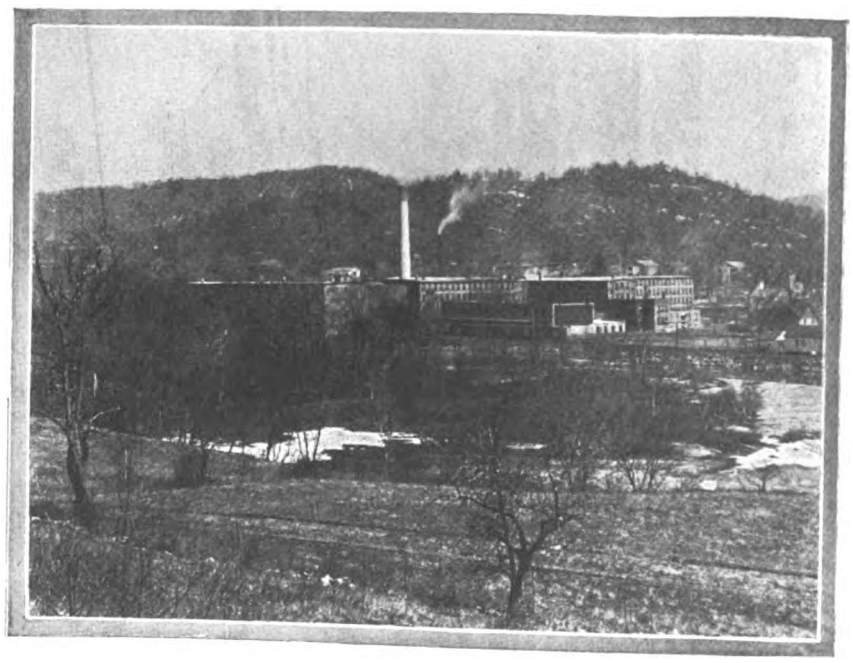
"What's the use," moodily replied Jim. "I get up at six o'clock mornings now. You get up half rested, as it is; hardly enough appetite to drink a cup of coffee and eat an egg. Time you get up five or half-past, pay ten cents car fare each way, and spend an hour or more on the cars, you're tired out. I done that once. You're dead all day."

"What are you going to do," sneered the other; "stay here?"

"I don't know what to do. This place has gone to hell. They don't seem to care whether you stay or get out. All they do is to stick up notices. I never seen one yet in the men's favor!"

"You never will," said the other. "I'm going to get out!"

"It's a hell of a country!" exclaimed Jim, anxious to present a convincing argument, as the other walked away. "They cut our wages, raise the rents, and profiteer all they want, and then they go and take away our beer!"



"Bristol depended, for its prosperity, on the factories and workers first of all."

The whistle brought noon and relief. Another worker, of socialistic tendencies, walked with Jim toward the shop gates. As they were passing through, they stepped aside to allow the shop owner's car to emerge. It glided past them, a large, expensive car, glittering with newness.

"There's your profit system!" exclaimed Jim's companion, seizing the ready illustration. "Our pay is cut; the Boss buys a new car. You and I paid for that!"

(*Continued on Page 36*)

"Many took advantage of the opportunity to get their own homes at reasonable cost.'





"These garden plots meant health, contentment, and a big saving on food."

Digitized by Google

The Ever Widening Field of the Typewriter

An Interview with Wellington P. Kidder

AMONG the many epoch-making inventions which have radically influenced human events in general, and industrial progress in particular, what *one* invention stands out as the most far-reaching in its effects? Casting about for an answer to this question, it seemed to the editors that the typewriter, if not *the* leading invention from this standpoint, is at least one of the leaders. So we decided to ask Mr. Wellington P. Kidder what he thought about it.

Mr. Kidder possesses a very unique distinction—he is the father of a truly quiet and well-behaved child, the Noiseless Typewriter. Although he modestly assigns a large part of the credit to associate engineers, Mr. Kidder is the original inventor of the principle of pressure printing by leverage, as distinguished from the hammer-blow principle.

"I believe it true," said Mr. Kidder, "that few inventions of our time have stimulated more of effort and achievement in every field of research than typewriting machines—hand maidens of the printing presses—'poems in mechanism.'

"To write at all, by machinery, even upside down or invisibly, was, at the outset, a great achievement. All credit to Showles of Milwaukee, no farther back than about 1872, for the practical initial step.

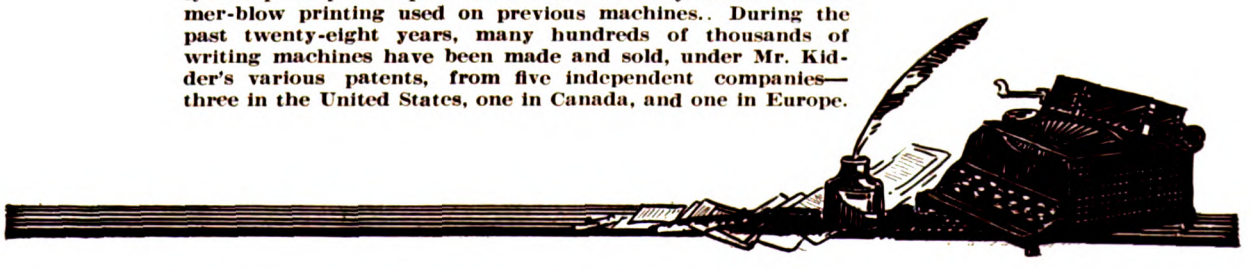
"The thought did not meet with favor at first. Recipients of typewritten letters—up hill and down dale as to alignment, and in capitals only—sometimes took offense, saying, 'you need not *print* words for us, we can read writing.' Others were amused and recommended *skilled* printers to set their type if this sort of correspondence was to be used.

"Soon it became evident that typewriting easily could be three or four times as rapid as hand writing and far more legible, with capacity for sev-

(Continued on Page 34)



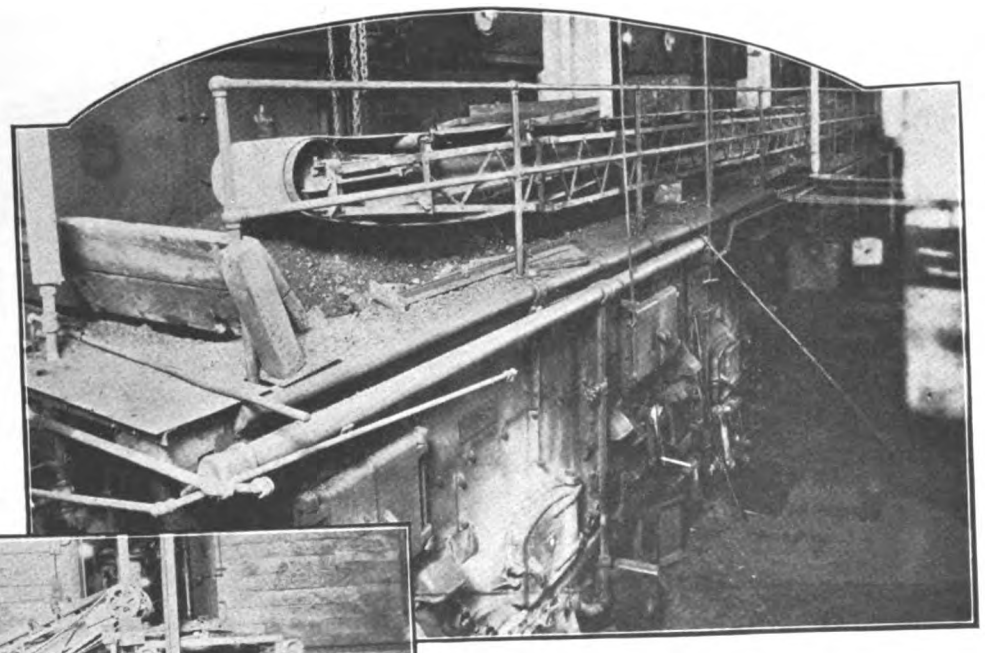
Wellington P. Kidder is best known as the original designer and inventor of the Noiseless Typewriter, employing a radically new principle of operation which does away with the hammer-blow printing used on previous machines.. During the past twenty-eight years, many hundreds of thousands of writing machines have been made and sold, under Mr. Kidder's various patents, from five independent companies—three in the United States, one in Canada, and one in Europe.



Digitized by Google

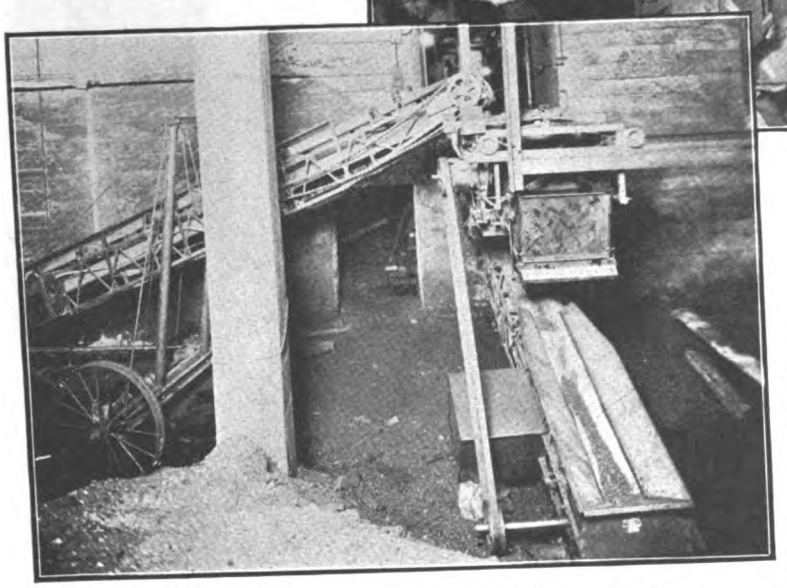
Coal Buying and Burning for Industrial Power

BY BROWNING ROBINSON



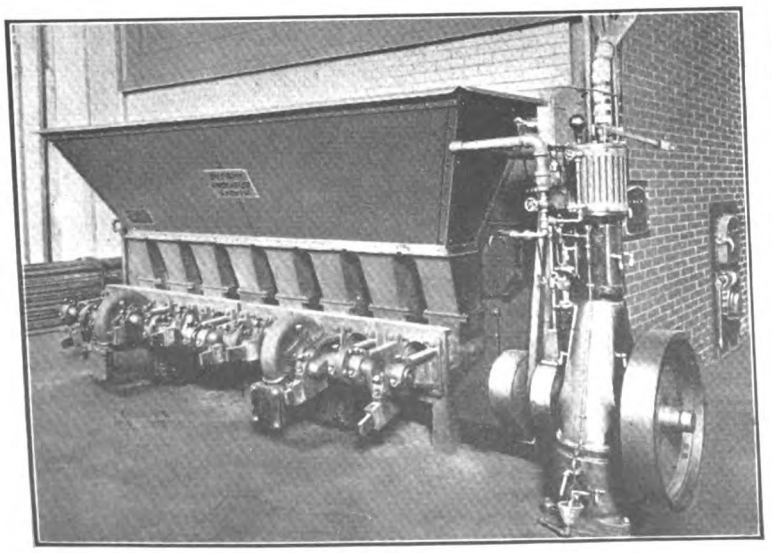
At the Montefiore Home and Hospital, New York, a conveyor is fitted with sweeps which brush the coal off at the desired point above the stoker.

Barber-Greene Co., Aurora, Ill.



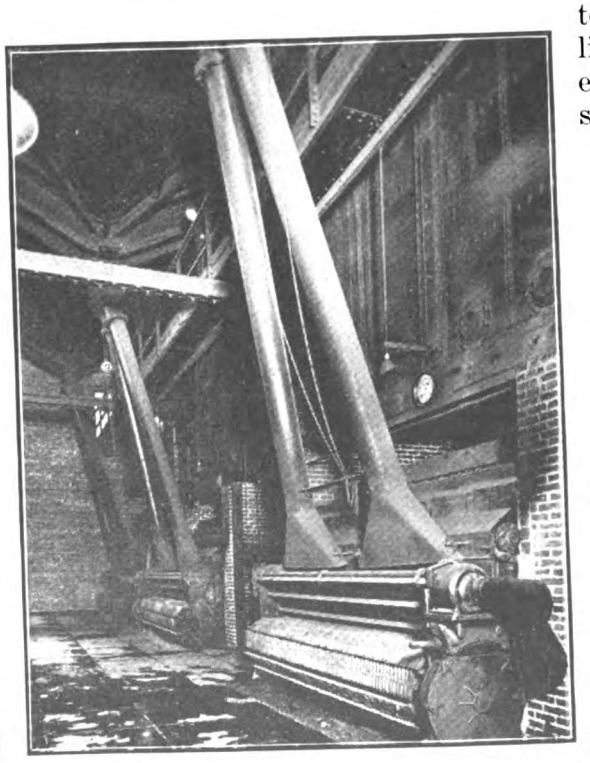
Feeding the conveyor shown above is the portable conveyor shown here which takes coal from the storage pocket and places it on the long conveyor shown at the right. In so doing all of the coal passes through the automatic weighing machine shown above. With this outfit one shoveler on the day shift and the night engineer in his spare time do the work formerly done by seven men.

Barber-Greene Co., Aurora, Ill.



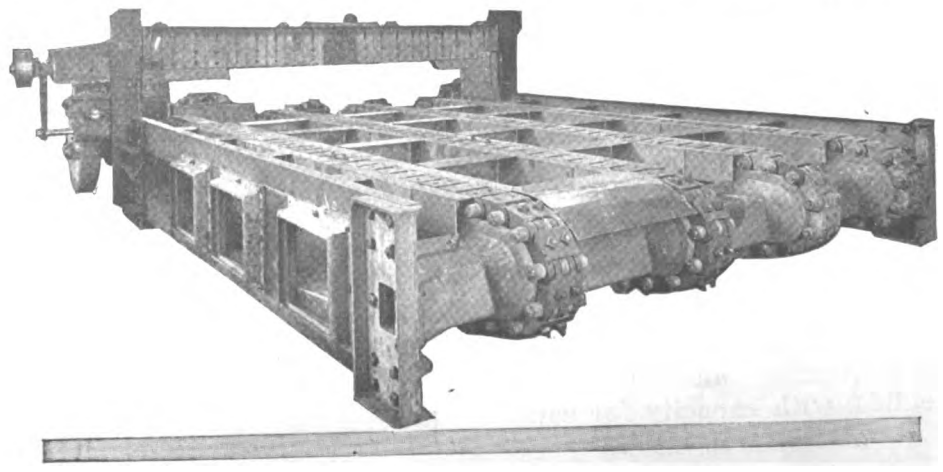
The mechanical stoker represents a great forward step in power plant engineering. In addition to largely eliminating labor costs, it increases the capacity and flexibility of operation of steam boilers. This multiple retort stoker at the plant of the Burroughs Adding Machine Co., has brought fires from a banked condition to 340% rating in five minutes.

Detroit Stoker Co., Detroit, Mich.



Mechanical stokers since they remove the element of skill from the firing problem enable the cheaper grades of fuel to be economically and efficiently burned. Here are shown three 720-horsepower boilers at the plant of the Chicago By-Products Coke Co., using Illinois slack coal and coke breeze as fuel.

United Machine & Manufacturing Co., Canton, Ohio.



Here is a semi-assembled rear view of the stoker shown above, depicting the cross girder and return tracks.

United Machine & Manufacturing Co., Canton, Ohio.

THE original American development of boilers, furnaces and stokers naturally occurred in the settled areas of the north eastern states. When eastern men engaged in the industrial migration to the central west they brought into western use the equipment with which they were familiar. In those days local fuel and labor were inexpensive, and waste little thought of. Coal analysis and differences in fuels were inconsequential. Smoky stacks, both in fact and poetry, were considered a sign of prosperity. Today we realize that only great profits could possibly have carried such a burden.

As communities turned attention increasingly to better living conditions, and plant executives began to scan cost sheets more closely, it was

Digitized by Google



Above is the boiler room of the Cadillac Motor Car Co. of Detroit. Modern plants spare no expense in installing equipment that will ultimately effect the greatest economy and pay the greatest dividends. Note the battery of seven 603-horsepower boilers, equipped with stokers.

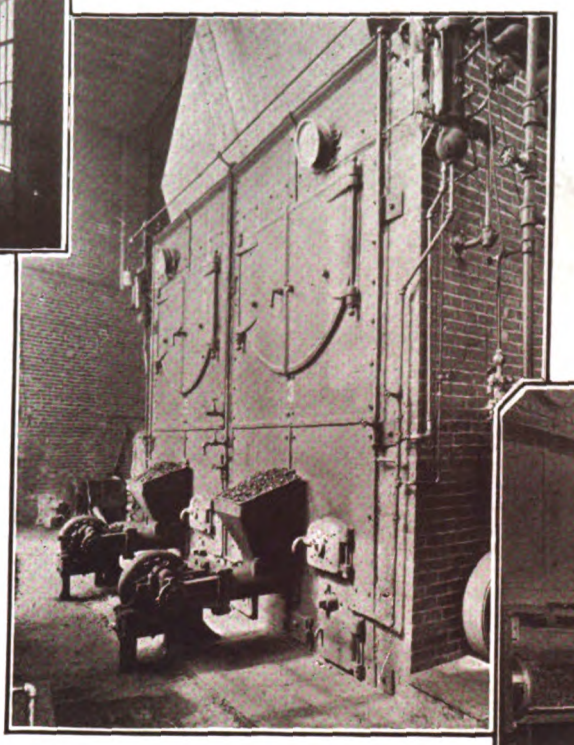
Under-Feed Stoker Co. of America, Detroit, Mich.

learned that much smoke, nuisance and waste were due to incorrect methods of handling fuels.

About that time was begun the primary study of differences in coals, rules for operating fuel-burning apparatus, and the investigation of grates, furnaces, and the correct burning of local fuels, all better adapted to the new conditions.

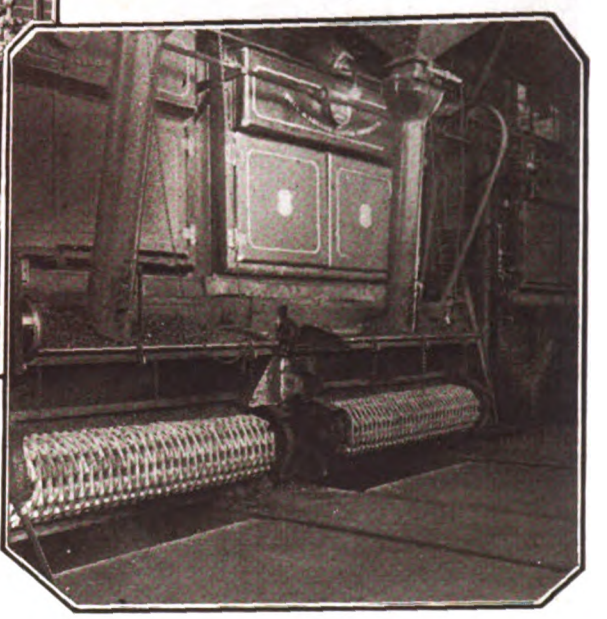
It must be thoroughly understood that there is even today no single equipment which will properly and economically handle all varieties of American coals.

Owing to the generally increasing sizes of power plants, hand firing is now less com-



Stokers are usually thought of in connection with large boiler units. This picture is notable in that it shows two 150-horsepower return tubular boilers at the General Aluminum & Brass Mfg. Co.'s plant at Detroit that are stoker-equipped. The investment is said to pay large yearly dividends.

Detroit Stoker Co., Detroit, Mich.

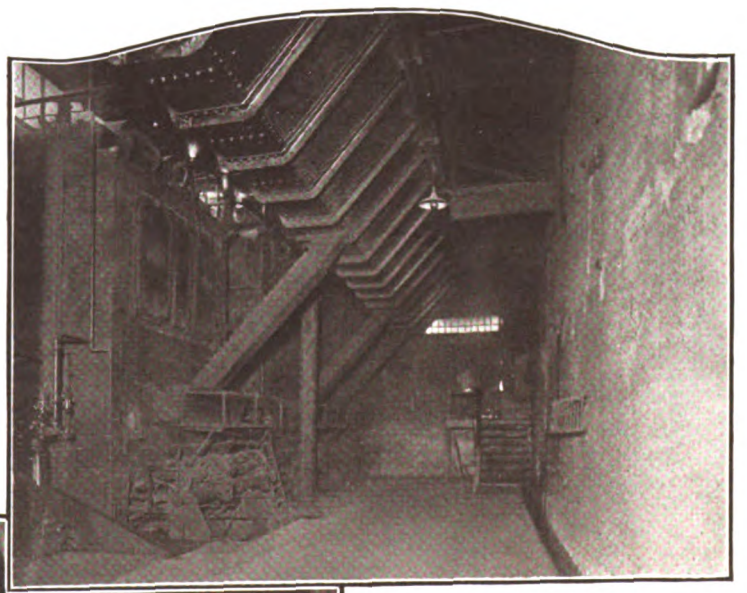


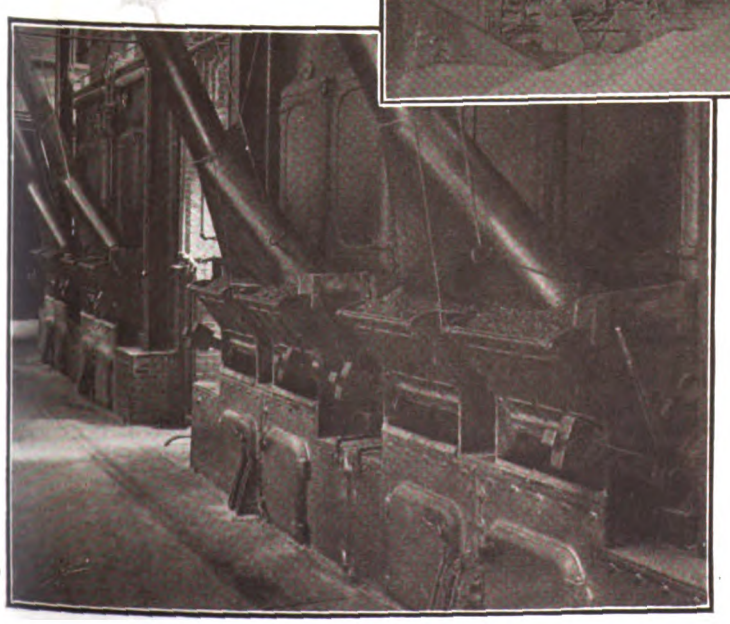
An installation of stokers at the Bell & Zoller Mining Co., Ziegler, Ill. There is an almost complete absence of dirt in connection with the operation of such equipment.

Green Engineering Co., East Chicago, Ind.

In the plant of one of the large paper corporations shown above they formerly had eight boilers tended by eleven firemen. Since the installation of mechanical stokers five boilers, two firemen and a water tender are required, and this is not all of the saving represented for the steam production has been largely increased even with decreased number of boilers.

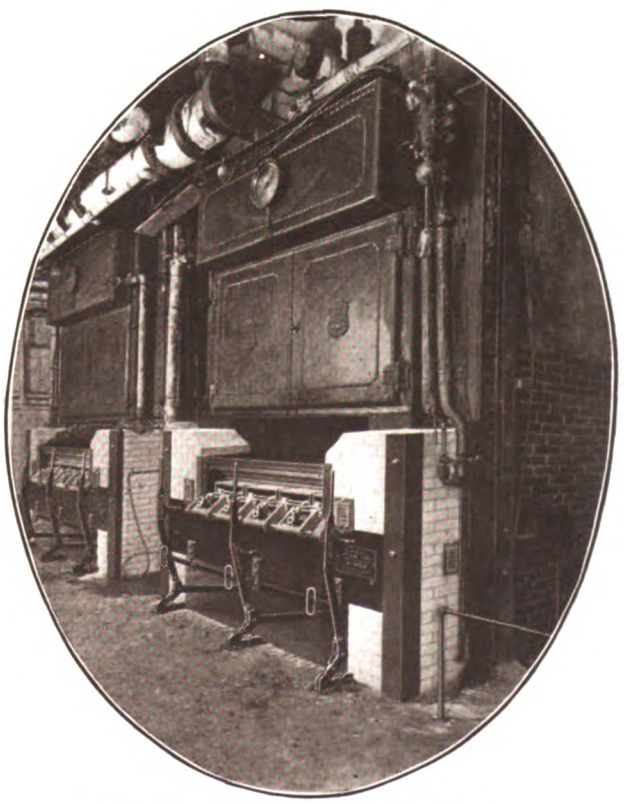
American Engineering Co., Philadelphia, Pa.





The installation of these four stokers under the 200 H. P. boilers of the Scranton Button Co., of Scranton, Pa., are reported to have saved nearly 6000 tons of coal per year.

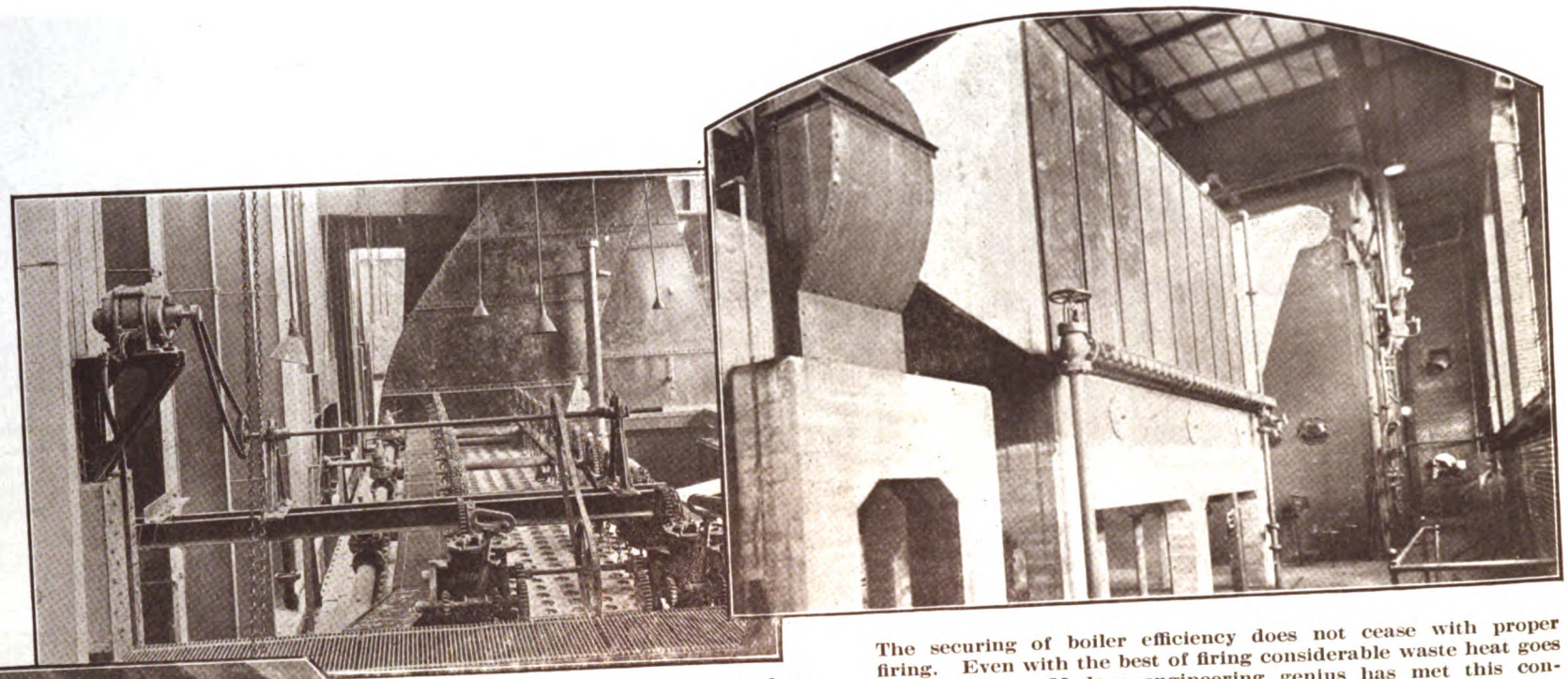
McClave-Brooks Co., Scranton, Pa.



The type of mechanical stoker shown above, installed at the Douglas County Court House, Nebraska, is called a low hopper feed installation because it can be put under a low set boiler.

CoKal Stoker Corp., Chicago, Ill.

Digitized by Google



The securing of boiler efficiency does not cease with proper firing. Even with the best of firing considerable waste heat goes up the stack. Modern engineering genius has met this condition by devising fuel economizers, which make use of the last usable heat unit. Here is a unit installation of boiler economizer and induced draft fans arranged for easy access.

Green Fuel Economizer Co., Beacon, N. Y.



To maintain maximum efficiency in heat transfer economizer tubes must be kept clean. The apparatus shown above is equipped with a scraper operating mechanism that is constantly at work cleaning the tubes and thus maintaining a high operating efficiency of the economizer.

Green Fuel Economizer Co., Beacon, N. Y.



This shows a type of rotary scaler driven by compressed air, steam or water, and applicable to either water tube or fire tube boilers. Passing this appliance through the boiler tube removes the scale.

The Roto Co., Hartford, Conn.

It is necessary to have the interior surface of hand holes scraped clean as well as clean flues. This picture shows a device for scraping the interior of hand hole openings.

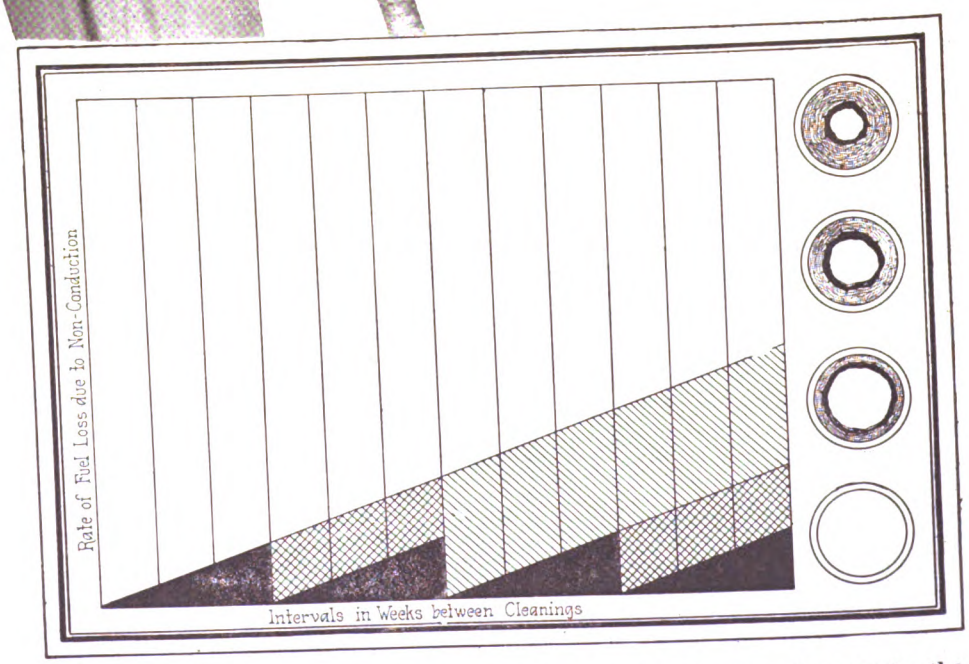
The Roto Co., Hartford, Conn.

monly considered. Some one of the many kinds of mechanical stokers is most apt to be installed in a new plant today, and if the plant is large there can be no consideration of having it fired by hand. With the planning of a large and modern steam plant skilled engineering talent is more apt to be focussed on the subject of selecting proper equipment and methods than was thought to be reasonable even a few years ago. We are, however, equally concerned with the problems of plants already erected and operating, whose conditions and equipment may be improved—with knowledge.

This device is a machine designed for cleaning B & W caps. Its capacity is from 100 to 150 caps per hour.

The Roto Co., Hartford, Conn.

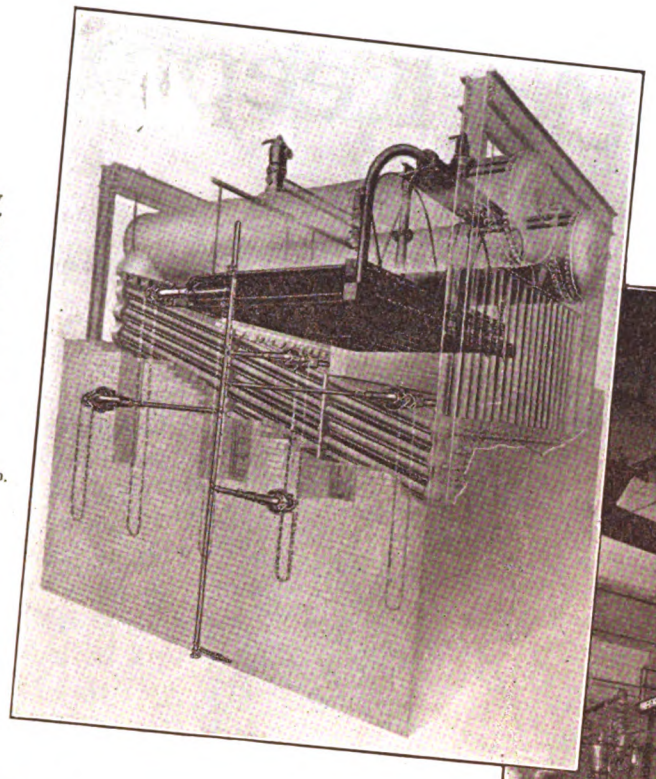




The importance of periodic cleaning is illustrated by this chart. The horizontal scale represents the intervals in weeks between cleanings, while the vertical scale indicates fuel waste due to loss of conductivity. Thus if average boiler tubes are cleaned every three weeks the fuel loss will be as represented in black. If they are cleaned every six weeks the cross-hatched areas represent the loss, and if every twelve weeks the fuel loss is represented by the total area.

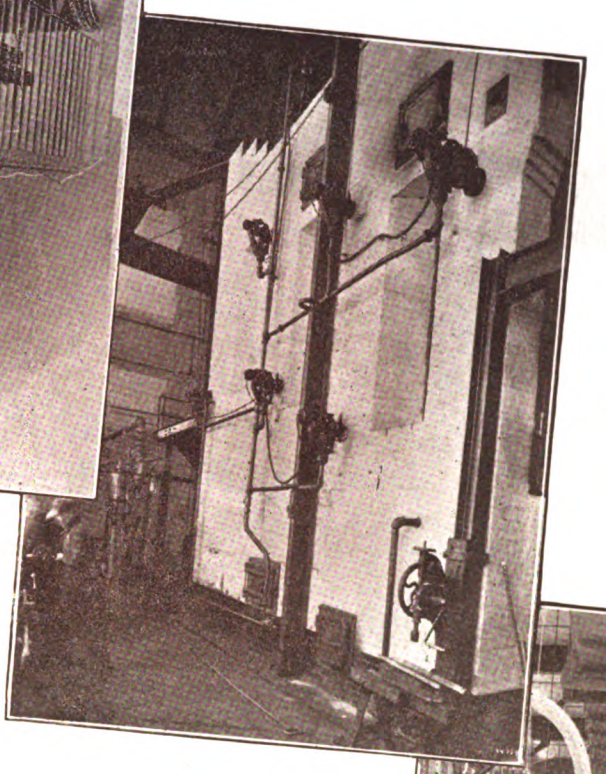
The Roto Co., Hartford, Conn.

Digitized by Google



Soot, which continually forms on the surface of water tube boilers, is an effective insulating material. As a result the efficiency of a boiler containing an accumulation of soot decreases. Here is a device for blowing the soot off of such tubes at certain intervals.

Diamond Power Specialty Co., Detroit, Mich.



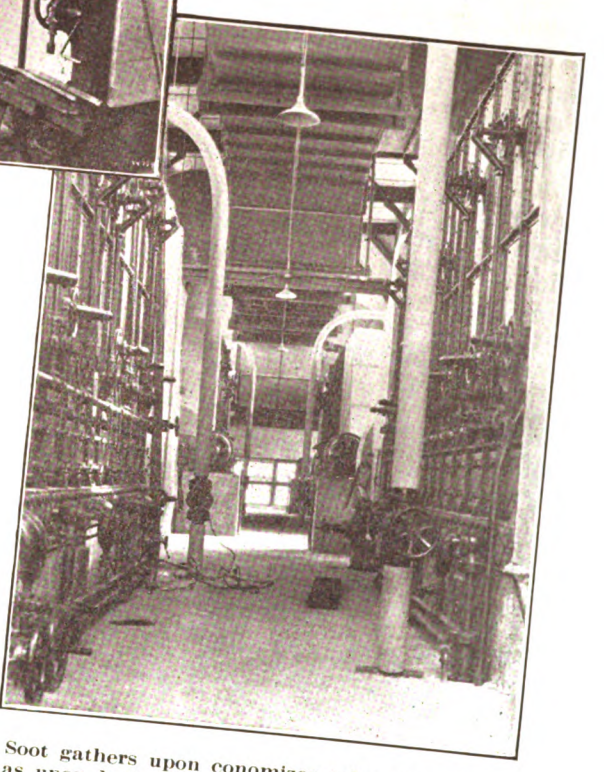
This illustration shows an entirely new phase of soot blowing. The operation in this case is automatic being effected either by means of a clock controlled electric motor or a timing device connected with the mechanical stoker engine.

Diamond Power Special Co., Detroit, Mich.

All coals consist of moisture, volatiles, carbon, and ash or residue which is unburnable. The heating value depends practically upon the per cent of carbon and the characteristics of the ash. Ash may disturb or interfere with the extraction of heat units. Otherwise it is unimportant except for the cost of handling.

One pound of pure carbon contains 14,544 British thermal units (BTU). The heating value of coal depends upon the

(Continued on Page 40)

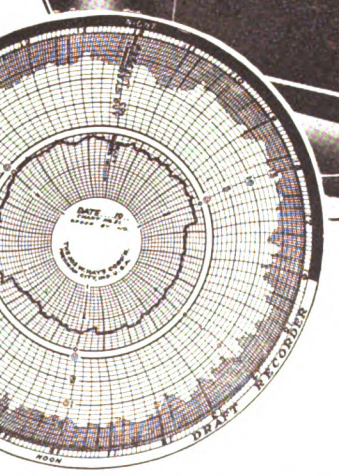


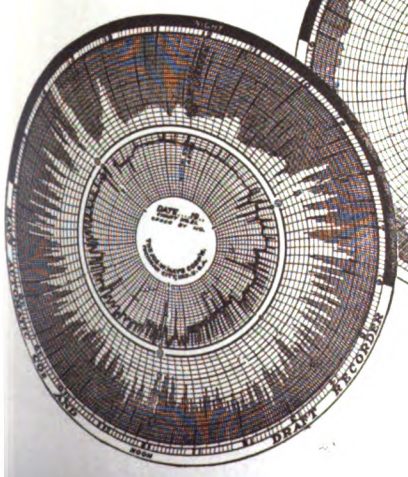
Soot gathers upon conomizer tubes as well as upon boiler tubes. Here is an installation of soot blowers on economizers which not only blow the tubes but also prevent soot from accumulating at the bottom of the economizers.

Diamond Power Special Co., Detroit, Mich.

Here is a machine which makes "moving pictures" of boiler performance. It works automatically, a small string of water furnishing the power, the operator merely putting in a new chart every day. It makes periodic consecutive records of draft over the fire and the percentage of CO_2 in flue gases. When you have this record in addition to the amount of coal and feed water evaporator per hour, you know about all there is to know about how your boiler is being operated.

Jos. W. Hays Corp., Michigan City, Ind.



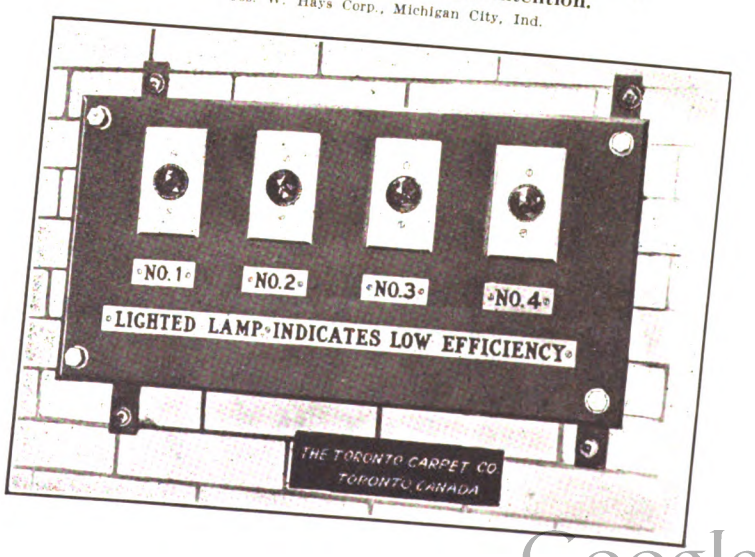


These charts are the "moving pictures" produced by the machine described above. The one at the left is from a hand-fired furnace and the one at the right from a plant in which mechanical stokers fed the coal. Pictures of this sort tell the sory of firing efficiency.

Jos. W. Hays Corp., Michigan City, Ind.

Above the chief engineer's desk at the Toronto Carpet Co., Toronto, Can., is an efficiency board which tells him how the coal is being burned.. When the CO_2 falls below the eight per cent. in any one of the four furnaces a red light calls the fact to his intention.

Jos. W. Hays Corp., Michigan City, Ind.



Digitized by Google

Modern Stock Keeping

By R. M. Nicholson

THERE are five fundamental essentials to economical and efficient stock keeping.

1. Preservation of stock
2. Elimination of loss
3. Ease of handling
4. Economy of space
5. Adaptability

Of course, the human factor is primarily responsible for the results obtained and this factor always will be variable. But any equipment, plan or system which makes it easier to avoid error, delay or loss is an encouragement to human effort. It gives man a chance to approach perfection.

Wooden bins and shelves, so common a few years ago, are now rapidly passing into the discard as a better and more efficient equipment has been developed and put into use generally by the more progressive concerns. This is the steel bins and shelving assembly.

Steel does not soak up oil, creating fire hazard. It cannot burn and offers no food for flames should a fire start in the plant. The advantage of this fire-resisting quality is emphasized by the two photographs at the bottom of this page, both taken in the building of the Sharon Hardware Company, Sharon, Pa., after a disastrous fire.

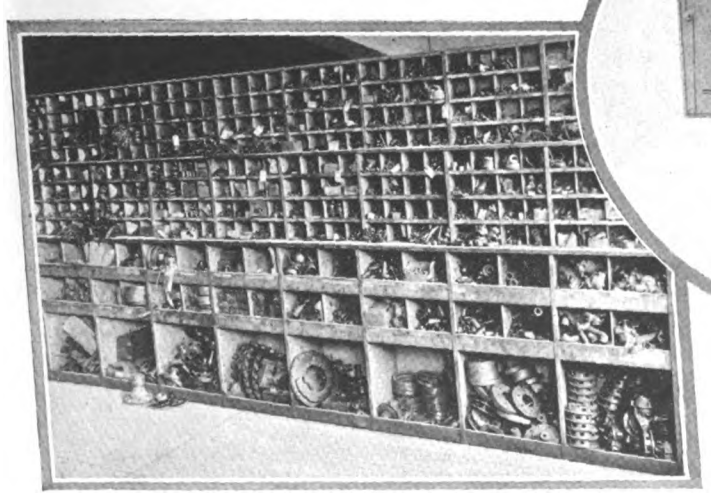
Aside from the graphic lesson on fire-resistance, the illustrations on this page give an idea of the capacity, versatility and convenience of steel; qualities which have been responsible for the rapid adoption of this kind of equipment in recent years.



Rack type of shelving used by the Johnston Harvester Company, Batavia, N. Y., for storing patterns. The individual shelves are 40 inches deep, by 60 inches long, with a capacity of 250 pounds.



The above illustration gives a comprehensive idea of the flexibility obtainable by combining various unit sections according to the individual requirements.

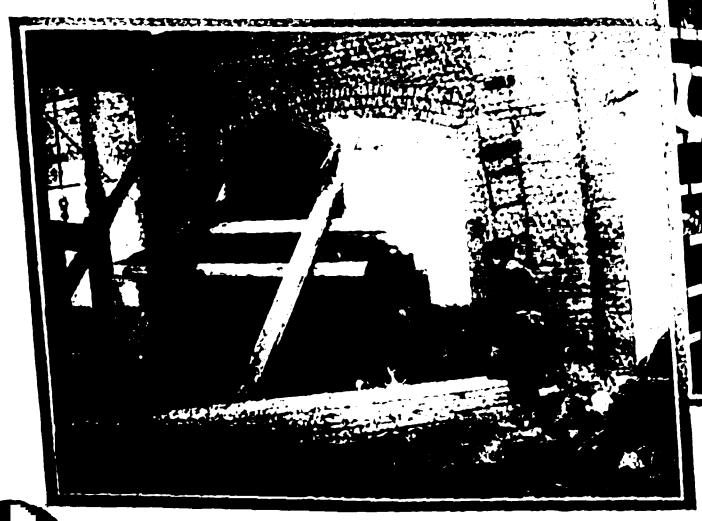


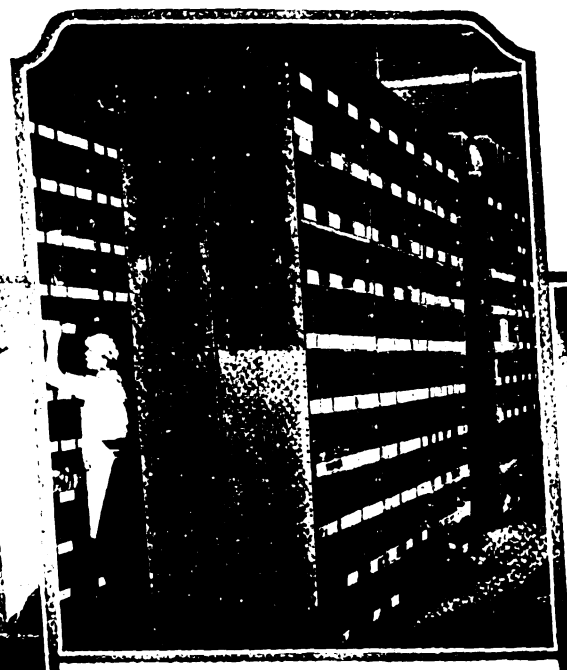
Thousands of pounds of stock parts stored in compact, accessible fashion, at the Albany Garage Company, Albany, N. Y.



Drills, taps and mandrels, as stored at the Johnson Bronze Company's plant, New Castle, Pa. Inclined trays make for "high visibility."

Below—At the plant of the Sharon Hardware Company, Sharon, Pa., wooden stock bins burned and scattered their contents when a disastrous fire swept the plant.





This ten-foot-high storage assembly is in use by the Westinghouse Electric & Manufacturing Company at South Philadelphia. Need of additional storage space was met by putting rows of extra units on top of the original ones.

Below—A section of steel stock bins which went through the fire at the Sharon plant without damage to itself or to the parts it contained.



Digitized by Google

The Future of Electrical Engineering

By Benjamin F. Bailey, Ph. D.

THE role of the prophet is dangerous. We can always see a little way down the river, but it is impossible to see what lies beyond the bend. It may be worth while, however, to consider some of the developments that are more or less within sight and to hazard a guess at some of those that cannot be so clearly seen.

One of the phases of electrical engineering that has assumed importance within the last few years and which will apparently be of increasing importance as time goes on is vacuum tube engineering. The vacuum tube only a few years ago was a laboratory toy; something for a college professor to play with when he had no better use for his time. Today it is not too much to say that it is one of the greatest factors influencing our civilization. The recent improvements in long distance telephony would have been impossible without its use. Radio communication, as we know it, especially telephonic communication by radio, is absolutely dependent upon the use of the vacuum tube. The marvelous results obtained in wireless telephony, particularly telephony between airplanes and stations on the ground, would have been impossible without it. We can send a telephonic current so faint as to be indistinguishable by ordinary means and by the use of a vacuum tube amplify it so as to make telephonic communication over thousands of miles practicable. The loud speaking telephone is an illustration of its use. Loud speaking telephones have actually been produced capable of giving such a volume of tone that a conversation can be heard a mile or more away. New developments are being produced so rapidly in this field that it is difficult to keep up with them and I should hesitate to predict what may happen in the near future.



Benjamin Franklin Bailey graduated from the University of Michigan as an Electrical Engineer in 1898, and received the degree of Doctor of Philosophy in 1907. After a varied experience with the Detroit Edison Company and the General Electric Company, he became an instructor and later (1913) Professor of Electrical Engineering at his Alma Mater—which position he now holds. Doctor Bailey is Consulting Engineer of the Fairbanks-Morse Electric Mfg. Co. and of the Howell Electric Motors Co.; inventor of the Bailey Electric Lighting, Starting and Ignition System; director of the Bailey Electric Co. and of the Fremont Motors Co., as well as Vice-President of the latter. He is a well known author and authority on electrical engineering subjects.

It appears entirely probable that the use of radio will become almost universal. I shall be surprised if within a few years radio telephones are not more common than wire telephones. By this I do not mean they will be used as wire telephones are to call up the grocer or the butcher, but I mean they will be installed as receiving outfits to listen to concerts, news bulletins, etc. An outfit to receive over short distances can be built for an incredibly low price and one capable of receiving thousands of miles can be built for less than the price of a phonograph.

The vacuum tube has also found a place in power engineering as a means of transforming from direct to alternating current or vice versa. They are built now to perform this service in small units, but it appears altogether probable that within a few years they may be built in the largest commercial sizes. At present to transform an alternating to a direct current requires an expensive piece of rotating machinery. The advantage of substituting for this a simple vacuum tube with no moving parts will be obvious. If this works out as it apparently will, it will not be at all surprising if our suburban electric cars and possibly our city cars as well are fitted to take alternating current at high voltage from the trolley wire and by means of a transformer and a vacuum tube, transform it on the car to direct current. If this can be done it will remove one of the stumbling blocks in the way of development of electric traction, particularly the heavy traction of electrified steam roads. The alternating current has great advantages for transmission but the direct current is decidedly superior for use in the motors for this particular service. This combination which will probably be worked out will be almost ideal.

I expect in the near future to see a great increase in the size of central stations and in the use of central station power rather than of power generated by the user. In addition great economies will be effected and much greater reliability given the service by the inter-connection of power plants by means of high tension transmission lines. It is not too much to expect to see the whole eastern part of the United States served by one huge transmission system with numerous stations all discharging their energy into a common net work of wires. Among other things this will permit the complete utilization of water powers which in many cases are now unavailable on account of the periods of low

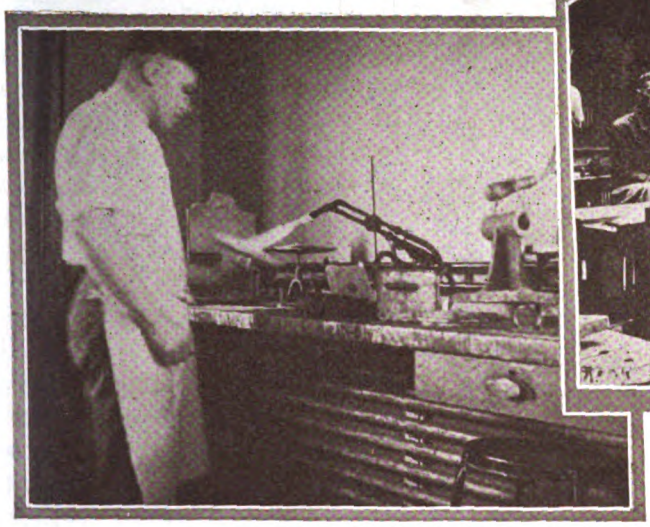
(Continued on Page 55)

Digitized by Google

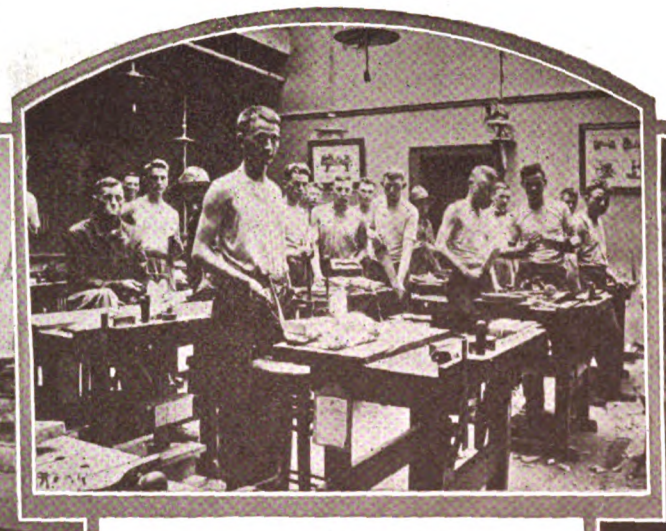
Getting at Facts About Our Machine Tools

Unique Experiments Being Conducted At a Large Municipal University

BY FELIX J. KOCH



It may seem a far cry, from laboratory experiments to watch-case assembling; yet the latter will undoubtedly benefit by the results of these researches.



There are endless problems to unriddle. The basic science of machine tools stands today where the steam engine stood just before Watt took hold of it.



Diamond cutters and polishers still employ very nearly the same tools as were used in the time of King Solomon.

IN a quiet little laboratory of the Engineering Building of the big Municipal University of Cincinnati, Professor A. L. Jenkins is conducting some unique experiments with machine tools.

He is trying to find exactly what a tool does when it does some of the simplest things known to the machinist's arts. He is asking his assistants some exceptionally rudimentary questions,—things such as:—

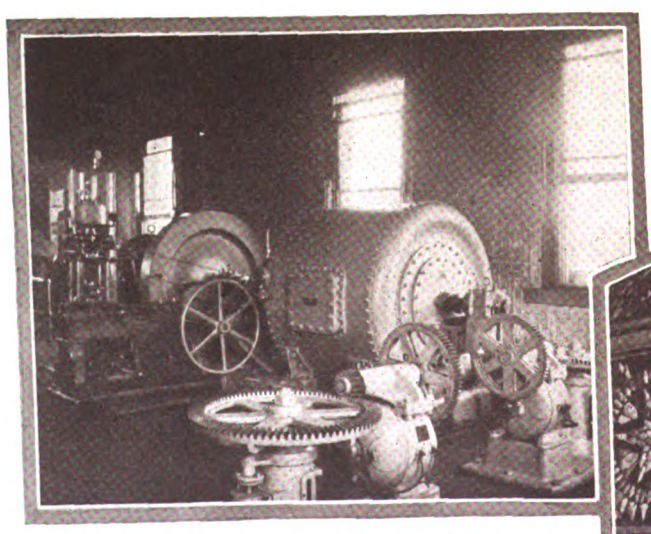
"Exactly what happens when you cut a piece of metal?" And he assures us that not only these graduate students and their directors, but he himself, and men of the caliber of Dean Schneider, head of the Engineering College and father of the "co-op" system in this country, are having a very hard time finding out!

It seems incredible, until you stand by and watch. The astronomy department has contributed what it can of the original whence of the matter which goes to build our earth,

(*Continued on Page 26*)

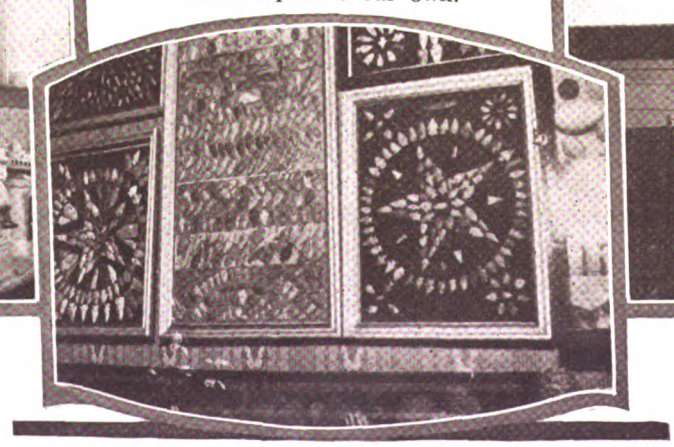


The airplane pilot, dependent for his very life on the functioning of intricate parts, will benefit materially from a better knowledge of machine-tool science.



Pumps, valves, gates—the whole science and practise of hydraulic engineering is intimately concerned with the knowledge of machine-tool science.

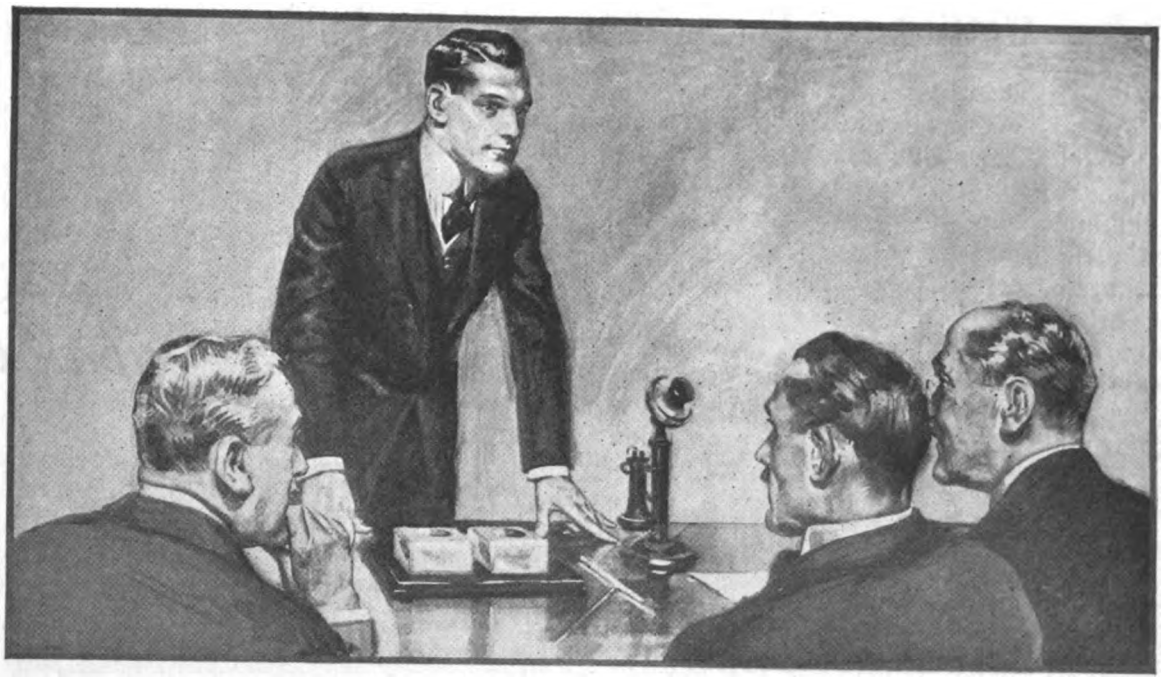
Primitive man, with his spear and arrow-heads, showed a knowledge of the principles of cutting-tools almost equal to our own.





More miles per gallon, more value per dollar of manufacturing cost —these are two of the results aimed at, in digging down for basic principles.

Digitized by Google



This actually happened in a directors' room

It helps to explain why executives are turning to the Alexander Hamilton Institute in larger numbers than ever before

IN THE QUIET, almost luxurious, directors' room the department heads of a certain large manufacturing company were called together by the general manager.

One after another the production manager, the purchasing agent, the head of the planning department and the sales manager expressed themselves. The burden of each man's excuse was the same: "If I had received proper co-operation from the other departments we would have met our quota easily."

The general manager spoke last, a keen, aggressive man of thirty-eight, who had been brought in from the outside.

"Gentlemen, you have told me far more than you imagine," he said. "It's perfectly clear what is the matter with this concern. You men have forgotten that it is *a business* and not merely a collection of departments. You are first-class specialists, crackerjacks in your own departments, but

Gentlemen, you are mighty poor business men"

They were too stunned to answer.

"I'll repeat it," the general manager said, "You—all of you—are poor business men. You're a group of stars but you aren't a team. Each of you knows his own viewpoint; he knows his work and knows it well. But you do not know enough about each other's problems to make this company an effective business unit.

"The sales department has got to know more about production, and accounting and costs; the production department has got to think more in terms of sales and credits—each one of you has got to get some *vision of business as a whole,* in all its varied and inter-related departments. That's what this company needs—and it needs it badly."

The next day, at the general manager's invitation, a representative of the Alexander Hamilton Institute visited that office; and every department head enrolled for the Modern Business Course and Service.

More than 24,000 Senior Executives enrolled

The Alexander Hamilton Institute was founded by a group of business leaders who recognized that modern business was tending to produce specialists rather than to develop executives.

Its appeal has been always to successful men, to men of mature years who had already made a favorable start in their chosen line of work. More than 24,000 executives have enrolled with it, many of them in company with their most trusted associates.

This is the significant thing, however: *In the past six months the number of enrolments received by the Institute has been larger than that at any similar period in its history; the average age of the men enrolling has been higher; their present position in business higher on the average than ever before.*

As never before, the *leaders* of business enterprises are demanding better business training for themselves and for the men on whom they most depend.

Will you spend an evening with the facts?

The facts about the Institute's Course and Service are condensed into a booklet that aims to answer every question which a thoughtful, ambitious man is likely to raise.

To promote a wider understanding of its training, its purposes and its results the Institute offers a copy of this booklet to any reader of this publication who will request it. In a single evening you can have the full facts. The booklet is called

"Forging Ahead in Business"

Just what the Modern Business Course and Service is and does; just how it has helped to solve the problems of hundreds of business in every line; just how individuals have used it to increase their own progress and earning power—all this is contained in "Forging Ahead in Business." It is a book worth adding to any business library; for your convenience in sending for your copy a coupon is attached.

Alexander Hamilton Institute
536 Astor Place, New York City

Send me "FORGING AHEAD IN BUSINESS" which I may keep without obligation.

Name.....
Print here
Business
Address.....

.....

Business
Position.....

Canadian Address, C.P.R. Building, Toronto; Australian Address, 42 Hunter St., Sydney

Copyright, 1922, Alexander Hamilton Institute

Digitized by Google

Getting the Facts About Our Machine Tools

(*Continued from Page 24*)

and which goes, therefore to make the ores from which come the metals which make both the things to be cut and the tools. The chemistry department is lending its aid to show just what happens when the heat of friction from cutting affects the metals involved. The physics department is contributing expert advice on the inter-relations of molecules and atoms. The professors of mathematics are working on the laws of action. There are staff meetings of the experts, ever so often; but they are frank to admit that, simple as are some of the questions, Professor Jenkins propounds, in the interest of the machinery world, they are to be classed with the things which "no feller has yet found out!"

"Just how are you seeking your answers, and just what will they mean to the big, non-college world?" we asked Professor Jenkins in his office, overlooking Burnet Woods and the other university buildings, while students in hundreds, attracted by the co-operative courses offered free here, passed back and forth outside.

"Answering your question hind-end foremost, in order to dispose of the shortest section first," he replied, pointing toward the shops where still other students were engaged in more elemental practice, "even the slightest discovery here will have an incalculable effect on the designing of all forms of machine-tools to be used the machinery world over. Metal and wood-working machine-shops both may be completely revolutionized. We will know how to cut material with minimum waste of power; we will know what we are doing."

Professor Jenkins is a powerful man; he's the sort of man Nature seems to have intended for directing giant lathes and bossing crews at giant derricks and things of that sort. He swung about in his swivel-chair.

"It doesn't seem possible, when you remember that tools are as old as civilization itself; but if there is one thing Man doesn't know anything at all about, it's the tools used in everyday life. Since even the keenest scientist knows nothing about what just those simplest tools DO do—just what a saw does when it cuts woods, and why, for one—you can guess for yourself what we know about the rest."

"The history of the development of any branch of engineering seems to show that it has progressed in proportion to the rate at which its underlying principles were made plain to all; then related, one to another; and then expanded to produce fundamental laws, which were expressed with mathematical exactness and so reduced to a science.

"Consider the steam engine, just as an example," he suggested. "The development, in the first stages, was very slow. The fact that steam will exert pressure was the first principle to be known here. Then it was discovered that steam could be used to create a partial vacuum, by causing it to condense in a closed chamber. The entire progress of steam engineering hung very largely on those two principles until 1769, when James Watt conceived of several others, which were readily developed into working laws. Once, though, the fundamental laws of the properties of steam,—of the mechanics of materials and methods of production, and of what we call 'thermo-dynamics' were developed, and expressed in mathematical forms, the development of steam-engineering progressed by leaps and bounds.

"Of course," he admitted, catching a touch of doubt on our features, "you'll suggest and I'll admit that the steam engine and the entire field of steam engineering, including even the heating of buildings by steam, MIGHT have been developed to a considerable degree as a result of necessity. It is, however, undoubtedly true that the present development could never have been achieved, without the *application* of the principles involved.

The internal combustion engine, I admit, was conceived by Hugens away back in 1680; but, due to the lack of scientific knowledge of thermo-dynamics, mechanics and the chemistry of combustion, the perfecting of this engine required more than four centuries."

He looked about him to where a series of panels, hung to rotate on a central bar, have not simply a schedule of all courses in the department over which he presides here, but also tell the exact topic of the day's discussion in each,—a novelty in the college-world, so far as the local folk happen to know. His eyes lighted on the title, AERONAUTICS, and he used this to emphasize the theme at hand.

"The phenomenal present day progress in the development of aviation," he put it "is due to the correlation of the principles and the interpretation of scientific laws, almost throughout.

"For an infinitely long time, machine-shop methods had been developed very slowly on an almost legendary knowledge, handed from father to son for many centuries. It is true that almost all mechanical engineering work is done in shops, and the greater part of the operations performed in doing this work involve the cutting of materials. Millions of persons have spent most of their lives in cutting metals and other materials. Great improvements in tools and in methods have been made, largely as a result of some sudden flashing home of an idea; and so it might be argued that as things were and *are*, they may as well continue to be. It is truer still, however, that our present knowledge of the fundamental laws invoked here is woefully insufficient to enable us to predict even the direction in which we expect to make our further progress.

"The labors of Nicholson, Taylor and Smith are meritorious, and important to a high degree, but they establish very few fundamentals.

"You see," he explained, leading the way down a corridor to where students were at work with varied sorts of steam-engines, "just as soon as the principles of thermo-dynamics were reduced to mathematical laws, it was possible to imagine an ideal engine, and to established a rational basis to use in comparing the performance of some existing engine with that of this ideal.

"By comparing the existing engine thus, it became possible to state the efficiency of another machine of the same sort; and thereby relieve the builder of the notion that he had produced an engine of the highest possible efficiency, when he had really only built an engine that was to be twice as efficient, say, as the average engine on the market.

"De Leeuw, one of the master minds in his field, once asked us, 'What are the things we should know about tools,—machine-tools particularly,—to enable us to make these follow the line of development which the steam-engine has enjoyed? Is it possible to develope a theory of the ideal machine-tool, such as has been developed for the steam engine?'

"After discussing the energy required to produce a failure with some object out of steel, by subjecting this to a tension load and then assuming a reasonable time-element for its stress, he reached the conclusion that 'If the only function of a machine-tool is the removal of metal, we would find that our best machine-tool has an efficiency of from .12 to .22. Even the better of these figures is very low when compared with the efficiencies of other machines.'

"Now efficiency is, of course, just a ratio to express a comparison;—and the value of the efficiency depends on the nature of the comparison. The values which express the thermal and the mechanical efficiency of engines differ enormously; hence it is necessary, first, to specify the terms to be compared. To illustrate:—

"Nicholson's theory of the efficiency of a lathe was not the mechanical efficiency of the headstock, but an efficiency which would compare those items in the specification for a lathe that is of economical value to the purchaser. He set aside such standards of comparison as 'maximum pulley-diameters,' 'minimum pulley-diameters,' 'maximum gear ratios,' and the quantity of belt passing over the pulley and considered the spindle-speeds, in the matter of their range and progression; also the number and ratio of back-

(*Continued on Page 28*)

Digitized by Google



A standard line of "K&J" Trailers, ranging in capacities from one to three tons, is regularly supplied. This line comprises both the all steel type and the wood platform type. Hyatt Roller Bearings are standard equipment in "K&J" Standard Trailers.

Part of An Order for "K&J" Industrial Trailer Equipment Being Assembled for Shipment

Big production—such as the normal "K&J" Industrial Trailer production—offers the buyer several important advantages.

Experience in designing and manufacturing increases with every lot manufactured. Experience in truck and trailer production has been piling up within the "K&J" Organization for more than forty years.

Responsibility increases as volume of production grows. The foundation beneath the reputation and prestige of each manufacturer is built of his products. A faulty product is a weak stone in this foundation; one that no great manufacturer can afford to permit. Therefore, quality and fitness in every "K&J" Industrial Trailer is a responsibility we owe to ourselves as well as to our customers.

Economy in manufacture and lower prices to the buyer result from big scale manufacture. The "K&J" Organization is the logical place to look for the most favorable prices consistent with fitness and quality.

Write for Bulletin No. 512



The Kilbourne & Jacobs Mfg., Co.,

COLUMBUS
OHIO U. S. A.

New York, 120 Broadway

Digitized by Google

The TROY
Automatic Engine
For Direct-Connected Electrical Work

The TROY VERTICAL Steam Engine illustrated below is most suitable for use, direct connected to small electrical generators.

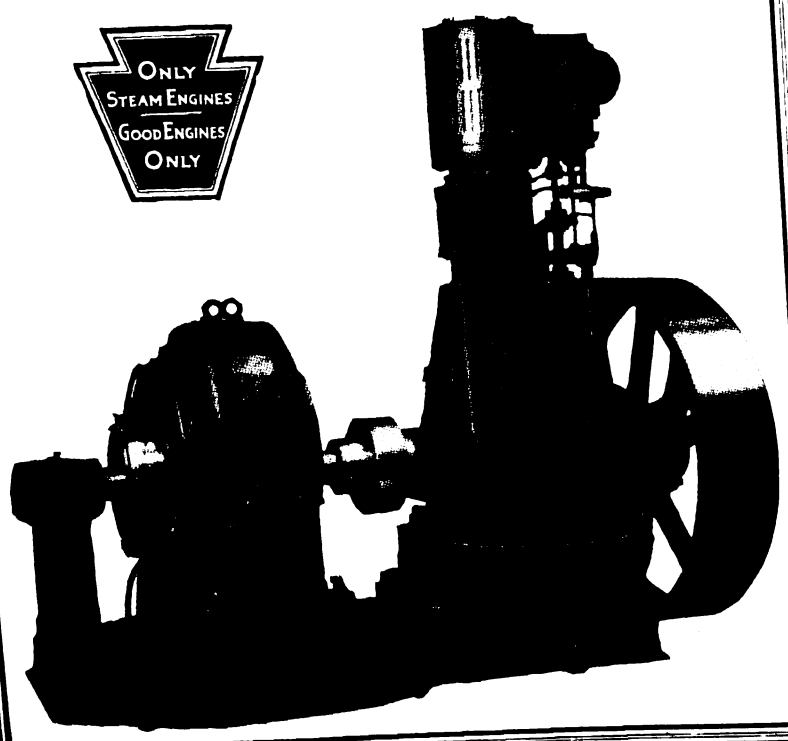
Its well balanced and dependable construction, the self oiling features and the TROY Record of thirty-one years, building "Only Steam Engines; Good Engines Only" has made this TROY Engine one of the best small prime movers in use.

The TROY Automatic Direct-Connected Engine is furnished with extended subbase and complete coupling but we can also furnish outboard bearing and armature shaft if ordered. The engine is built to suit any standard make of generator.

TROY ENGINES are also built Horizontal. We specialize in steam engines from two to two-hundred Brake-Horse-Power.

Our booklet No. 6 describes them fully. Write for a copy.

TROY ENGINE & MACHINE COMPANY
TROY, PENNSYLVANIA



(Continued from Page 26)

gears and counter-shaft speeds; then the size of the cut that may be taken at the various speds.

"This sort of problem is necessarily a complex one and the methods required by it involve many details which might be criticized in certain quarters; but he has made it possible to at least estimate the value of any given design of headstock relative to a standard of reference, and to express this value numerically, in terms of the cost of machining a unit of metal.

"This method consists essentially of comparing the metal-removal rates obtained from speed-torque diagrams drawn for the machine considered, and for a machine representing certain standards.

"What follows, then, is merely a matter of carefully executed formulae."

"We have these formulae, and many more are being compiled,— but there's been precious little done toward advancing our knowledge of tools, when it comes to putting such facts to practical use," he said.

"When we come to fundamental facts about the actions of our tools, we really know next to nothing at all. Take just the matter of the relation between the feed, cut-speed and depth of cut,—a typical fundamental principle. On this subject at least twelve equations have been worked out—and they not only don't agree in numerical values, but their very forms fail to agree. One man has the cut-speed varying to one part of the depth; another as to the other. We know that there must be an underlying principle there, but we don't know what it is. Smith, Herbert and Nicholson each give us different equations; but no one has determined just which is the correct one."

"And when we do get the major number of these formulae firmly fixed, then what?" we asked, wondering what might lie beyond all this, in this far flung field of mechanical science.

"Then,—well, of course, we can imagine an ideal engine, and we will keep comparing the engines of the day to this one. We will know the efficiency of the ideal engine; we will find the exact efficiency of a given engine, and show its builder how far he comes from perfection here. We will know, absolutely, the limitations of our engines. We are limited by the exhaust temperature of steam. We cannot expand that indefinitely; but we will know the limit to which we CAN go. We will have had determined for us other recognized losses."

"Which may lead on to . . ." again we parried.

"A search for some new things to substitute for steam in expansive work. The laws of thermo-dynamics have been so thoroughly covered that there are not a great many unknowns left. Some of these will be explored then. We will learn more about the inflow-engine, for example; we will get more results from its condensation and evaporation in the cylinder.

"We haven't reached the limits with steam; near to them though we seem to be.

"Just now you know," and the Professor touched on a subject dear to his heart, but of which he is still telling little, "the *live* things for experimental work is the internal-combustion engine. The exact workings of the carburetor, the part such an engine can still be advanced to doing with the automobile, the gas-engine, the oil-engine—they provide an infinite field for work. Getting such an engine to give more miles per gallon, with the automobile,—to yield more horse-power per unit, in the stationary engine, is the task assigned.

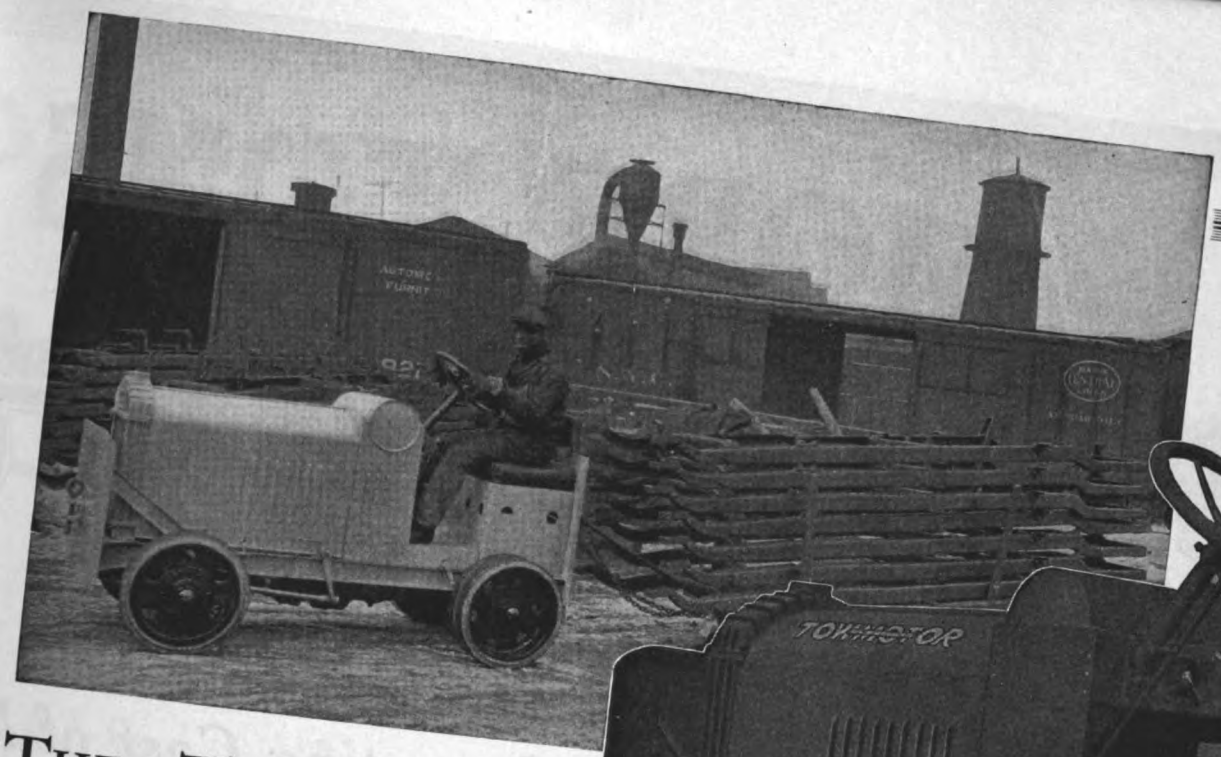
"It's not a matter, then of increased efficiency in the instrument itself, it's a matter of using that instrument and yet getting the same,—or still more work with cheaper fuel. Remember, we've the diminishing coal and oil supplies to look ahead to.

"And all of these things go back to the initial thought: all of these machines resolve themselves to parts; and all of those parts must be shaped by tools; and the better these tools, the better these wares.

"The science of machine-tools stands today where the steam-engine stood just before Watts took hold of it. We must find a theory for an ideal machine-tool, as Watts did for the ideal steam-engine.

(Continued on Page 32)

Digitized by Google





THE TOWMOTOR
at the Plant of
The Peerless Motor
Car Co.

Cost Economy Where Production Starts

In the automotive industry every step of the productive process is carefully watched. Competitive methods do not allow any wastes. Sales are based on keeping production costs to the absolute minimum.

But efficiency in production does not end in the plant. The heavy haulage of raw and finished materials is also considered and efficient haulage is a necessary item in maximum production at minimum cost.

That is why The Peerless Motor Car Company has been using THE TOWMOTOR to solve its haulage problems and that is only one example among thousands.

THE TOWMOTOR is a rugged self contained power unit. It is an industrial tractor, driven by a gasoline engine. THE TOWMOTOR is a rugged, all steel machine, built of the highest grade standard units. It is not a remodeled automobile, but has been especially designed to fulfill the demands of the heavy duty 24 hour uninterrupted service and the maximum demands of industrial haulage.

There is sufficient power in THE TOWMOTOR to move freight cars and still operate economically in hauling light loads. It is equipped with a governor which allows efficient operation at any speed from 1 to 15 miles per hour.

THE TOWMOTOR is sold with a liberal guarantee. All parts are absolutely guaranteed against defects.

Whatever your requirements may be we are sure we can prove to you that THE TOWMOTOR will reduce your haulage cost considerably.

Write to us for further information.

THE TOWMOTOR COMPANY

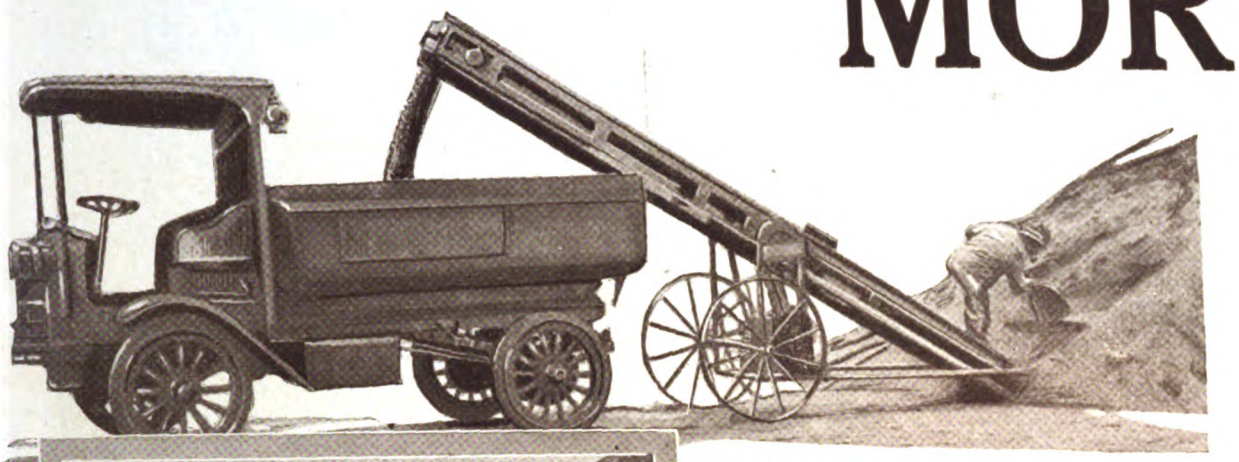
CLEVELAND Collamer Ave., and 152d St. OHIO

THE TOWMOTOR

A Gasoline Industrial Tractor

Digitized by Google

MORE TONS PE



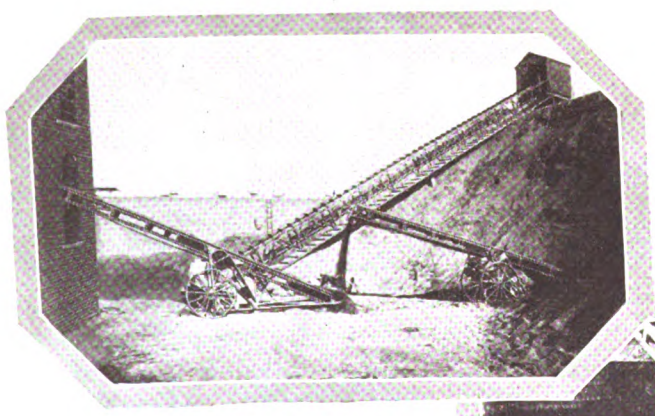
ABOVE—Loading coal into truck at the Campbell Morrell Co., Passaic, N. J. Note ease of feeding.



ABOVE—The flexibility and economical operation of these machines at the Gera Mills, Garfield, N. J., enable them to save a large amount of money in unloading their coal from cars to storage and then reclaiming to boiler room.

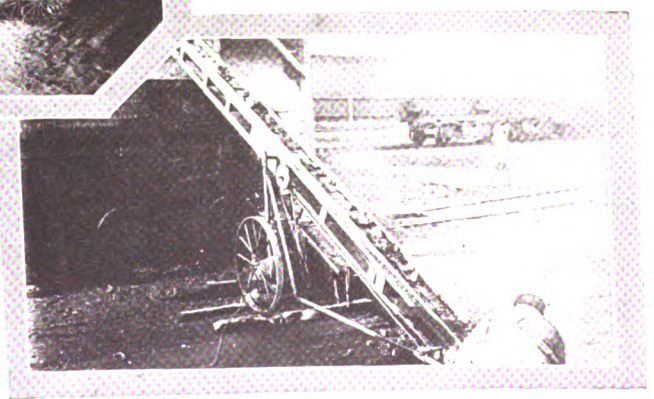


ABOVE—The Scoop Conveyor loading an electrical truck trailor for delivery to boiler room. This is an ideal installation where coat is received at a distance from the boiler room.



ABOVE—Two Scoop Conveyors in tandem style reclaiming coal direct from storage pile to boiler room at the Standard Oil Cloth Co., Athenia, N. J.

BELOW—Loading cars at the Carnegie Steel Co., Mingo Junction, Ohio.



Operating Cost of New Models Guaranteed Not to Exceed

WAS ever a portable conveyor so amazingly economical as this New Scoop Conveyor?

Ever since its debut 6 months ago the conveyor has been subject to an ovation in which Europe and America have joined.

Now, with more than 500 of the New Models in the hands of owners, the advance favor and faith in the Scoop Conveyor is repaid, we believe, by the reliability record it has established.

As owners of preceding models heartily testify, the Scoop Conveyor has always been singularly economical to operate.

But reports from owners show that new models are operated for less than half of the operating cost of any previous Scoop Conveyor.

Even this pointed tribute to the new model's economy is overshadowed by the positive expressions of praise from owners,

Write for C

THE S CONV

PORTABLE MACH

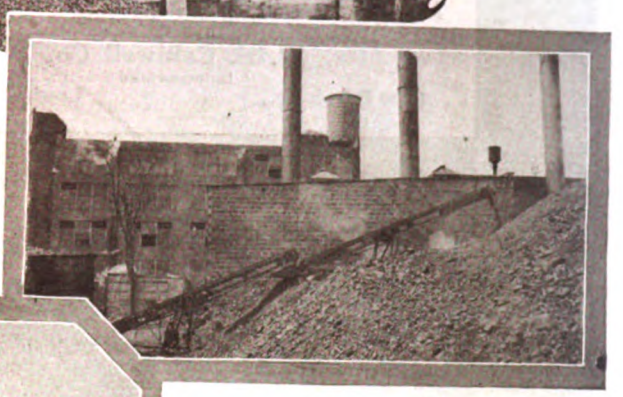
PASSAIC,

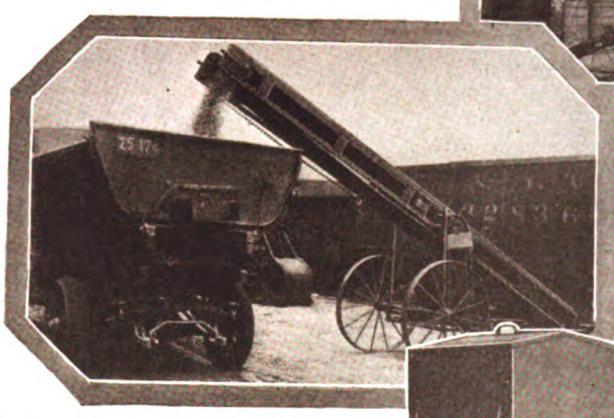
Digitized by Google

PER DOLLAR



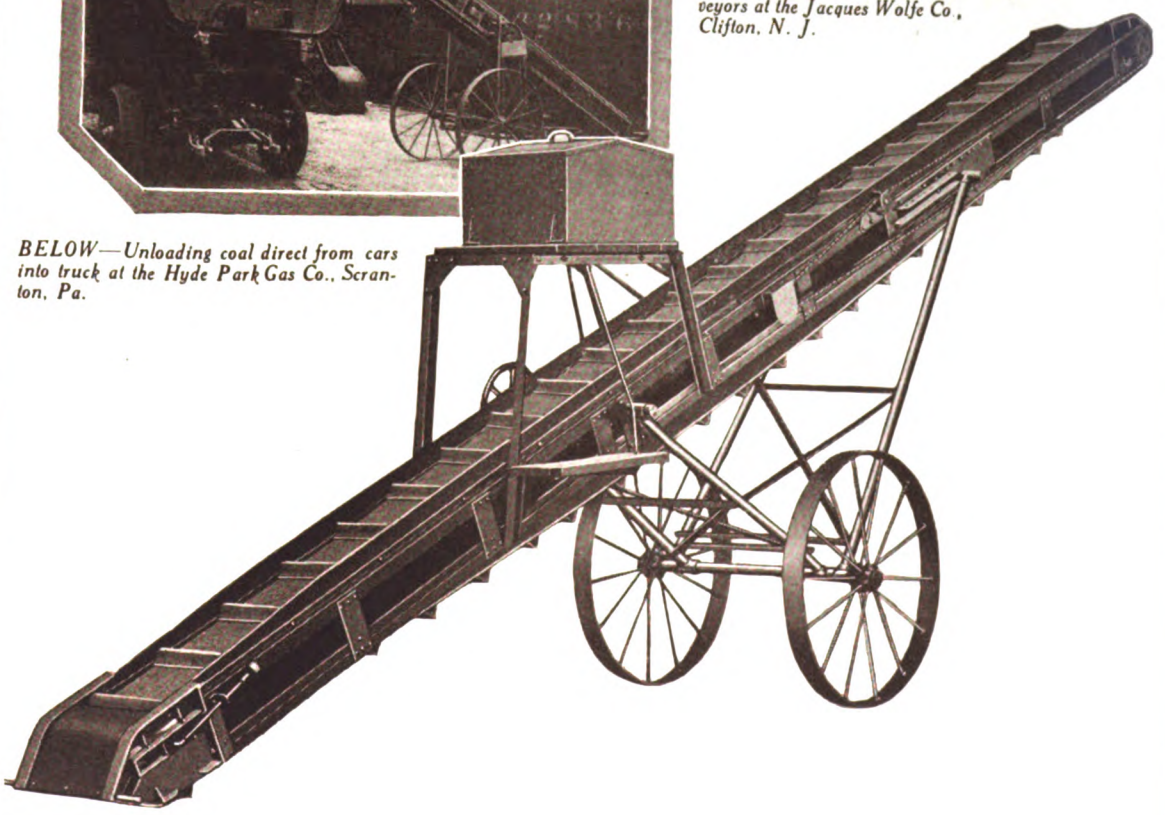
ABOVE—Unloading 50 ton cars in three hours at the Carey Salt Co., Hutchinson, Kansas.





ABOVE—Unloading and Storing Coal with two Scoop Conveyors at the Jacques Wolfe Co., Clifton, N. J.

BELOW—Unloading coal direct from cars into truck at the Hyde Park Gas Co., Scranton, Pa.



...eu Model Scoop Conveyor ...ed One Cent Per Ton Handled

many of whom have handled large tonnage under all conditions.

In numerous instances owners of the new model report that their conveyors have required no expenditure whatever except for power and lubrication.

They pay glowing compliments also to the increased power, the greater capacity and the real portability of the new model Scoop Conveyor as well as to its dependability and wide adaptability.

But the one fact upon which all seize and ardently emphasize and recur to again and again is the new Scoop Conveyor's amazing economy which they insist has never been equalled or approached before, even by the fine Scoop Conveyor forerunners.

In fact, owners of the conveyors are unanimous in proclaiming the 1922 Model the greatest Scoop Conveyor ever produced.

What bears them out in this verdict and establishes completely the New Model's preeminence is the fact that orders have come in so fast that all former production schedules have been exceeded.

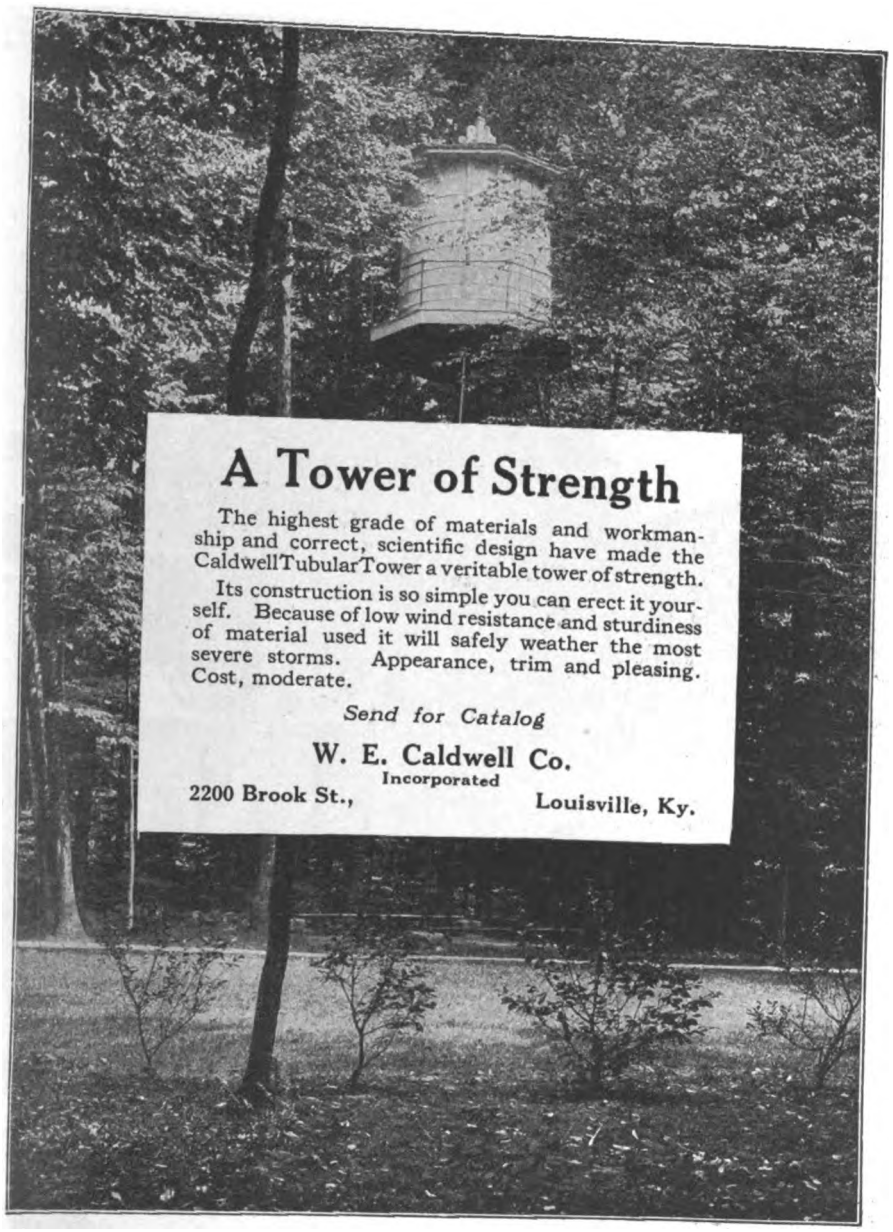
Catalog No. 63

...COOP ...VEYOR

...INERY COMPANY

...NEW JERSEY

Digitized by Google



(Continued from Page 28)

"Mind you, I say, we must find a *theory*. No one can conceive what the ideal machine-tool would be. With any metal-cutting tool, the largest part of the energy consumed is used in starting the chip. Once the chip is removed, the big part of the work consists in shearing, pressing, extending and the like. We know now what it costs us to do this with the finest tools to hand. We want to determine what it would cost with an ideal tool. Then we will work towards that goal."

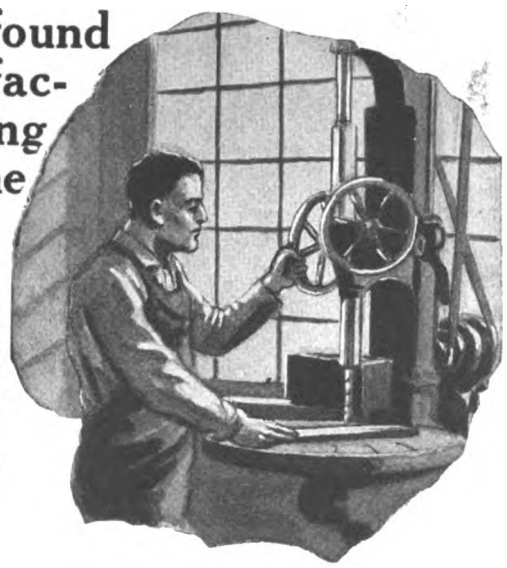
To determine these facts, Professor Jenkins has set men to work at some of the finest and latest machines for such work in the world. One such instrument alone came to $5000 when purchased not long ago!

The men, though, are discovering that they have stepped into the middle of the story; that they must get back to the start. They must start, that's to say, with elementals.

The men, as they come to this conclusion, are being sent to the metallurgist, then the chemist, then the geologist, the physicist, and eventually the astronomer, to learn beginnings. They are going to learn exactly what occurs when tools do their work.

In other words, they are going to ferret out the very fundamentals of the Big Beginnings. These secrets disclosed, they will turn in their tracks and, employing the rare, costly knowledge so gained, they will immediately set themselves to the tasks of conceiving, then approximating, and, eventually—speed the day, of course—*producing* actually PERFECT tools of whatsoever the sort!

"—and have found it very satisfactory in reducing the *glare* of the summer sun."



The H. H. Franklin Mfg. Co., of Syracuse, N. Y., have applied BLU-EE to a considerable area of factory sash with wonderful results. It reduced the glare of the sun's rays and produced a "cool, pleasant light inside the factory." An example of hundreds of satisfied users.

BLU-EE Cuts Out the Glare
TRADE-MARK

It is not a mere question of comfort, but glaring light causes eye strain and retards production to a great extent. ¶BLU-EE keeps out the heat and glaring rays. It only allows those rays to penetrate which give a diffused, filtered light, restful and beneficial to the eye, helping the workers do better work. BLU-EE is easily applied with a paint brush. Easily removed when you wish. ¶Fill in the coupon below and send it in today. This will convince you what BLU-EE will do for you.

PARK CHEMICAL COMPANY
3822 Edwards Road **Cincinnati, Ohio**

Try It Out—We Run the Risk

PLEASE send me 2 packages of Blu-EE, sufficient to cover 2000 square feet of glass. It is understood that I am to use one of the packages as directed and will remit $5.00 for both if I am satisfied with Blu-EE, and if not entirely satisfied may return the other within sixty days and you will cancel this order.

Firm Name..... Position.....
Your Name..... Address.....

The Making of a Filament Lamp

(Continued from Page 13)

heated in an electric furnace which welds the fine particles together into a solid mass. Then the ingot is "swaged"—placed in multiple hammer machines which hammer it on all sides at the rate of 12,000 blows per minute. The ingot is passed successively through some thirty of these swaging machines until it becomes a rough wire of ductile tungsten, 65 times its original length. The tungsten wire is drawn through a series of dies of diminishing sizes until it has the correct diameter—and the diameter varies for lamps of different wattages. The diameter of the wire is determined by weighing a definite length. The drawn wire is spooled and sent to the lamp factory.

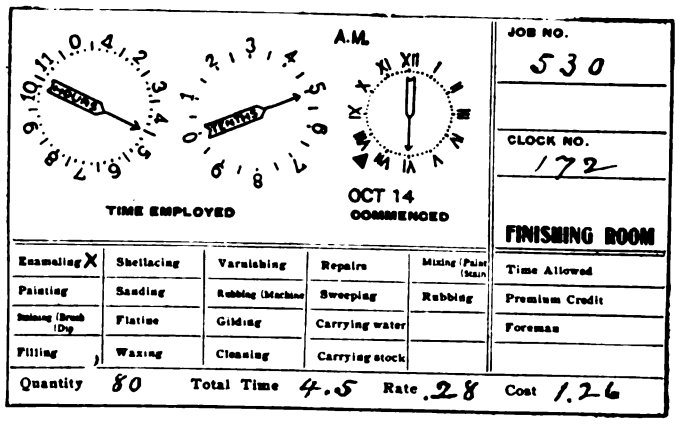
"Lead" wires, the wires which carry the current into the lamp, are made of copper wire, except for a small portion known as the "press-lead." This is of a special composition which has the same contraction and expansion characteristics as does glass. These wires are made in a separate factory and are shipped to the lamp factory.

The bases of lamps are made of brass, which comes to the base works in bandage-like rolls. From these rolls machines cut small disks which a series of dies gradually form into cup-shaped shells. These shells are threaded by stationary and rolling dies and are conveyed to other presses where the ends are punched out. Other disks, cut from strips of brass, are punched through the center to form eyelets. Then the eyelet and the shell are insulated from each other by molten glass, the glass being poured into the shell and around the eyelet. And the finished bases are sent to the lamp factory.

The lamp factory is the assembling plant. Here the various lamp parts meet for the first time. The glass tubing is cut by machines and heated at one end so that a mechanical finger can flange it. The cane glass is made into "button rods," into the ends of which are inserted hooks on which the filament is wound. Then the flanged tubing, the button rod and the lead wires are assembled to form the "stem," which supports the filament of the lamp. The lead wires are

(Continued on Page 34)

Digitized by Google



The Calculagraph Way

One backward-forward movement of the right-hand Calculagraph lever when the job starts, a pull on the left-hand lever when the job is done, and the time record is complete.

The elapsed time can be read directly from the card. Without any figuring or possibility of error.

Any number of employees can use one Calculagraph without confusion of records.



This Record— Can't Be Faked

When a Calculagraph is used you can feel confident that your time records won't be faked. The hands on the clock can be manipulated----but setting the hands on the clock face of the Calculagraph will not in any way change the elapsed time record---the movement must actually run to compute elapsed time.

The Calculagraph is a spring-driven, self-contained instrument; there are no wiring or electrical troubles with consequent high maintenance cost.

There is no figuring with this machine---- the calculations are all mechanical, and its construction will enable it to withstand the hardest usage.

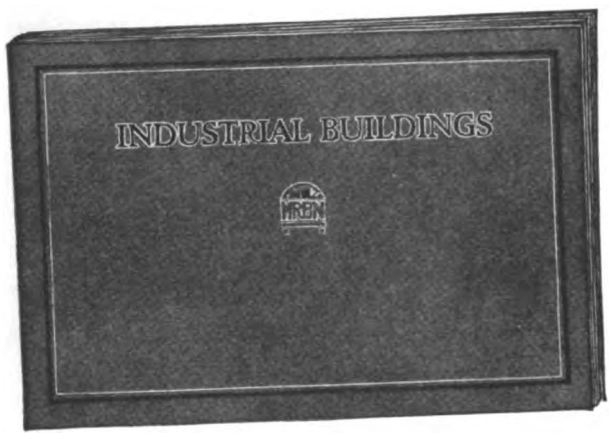
Send today for your copy of "Elapsed Time Records"

THE CALCULAGRAPH

THE ELAPSED TIME RECORDER

34 Church Street **New York, N. Y.**

Digitized by Google



A Personally Conducted Tour *of* Inspection *for* Factory Owners

WOULDN'T a trip through twenty-five modern industrial plants, including factories, foundries, forge shops, machine shops and power plants give you some good ideas to use in your own plant?

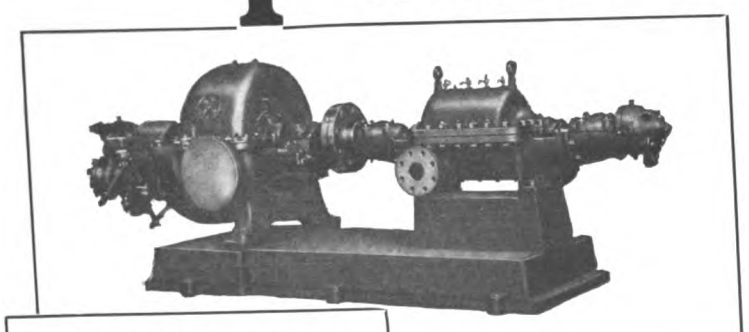
That is practically what *Industrial Buildings* gives you, for it contains not only exterior and interior illustrations of twenty-five modern industrial plants, but floor plans, cross sections and plant layouts, as well as interesting facts about every one of the plants illustrated.

We are offering to send a copy of this booklet gratis to any factory owner or executive.

Write us today for your copy.

MILLS · RHINES · BELLMAN & NORDHOFF
Engineers
TOLEDO · OHIO

MORRiS PUMPS



Centrifugal Turbine Driven Boiler Feed Pump

No water seals are necessary in the Morris horizontally split Boiler Feed Pump of 2 in. and 4 in. sizes. The impellers are arranged opposite each other—the suction is in the middle of the casing between the impellers. Thus the stuffing boxes for the pump shaft are always under pressure, so that there is no tendency toward air leaks to break the suction. This is important when the pump operates under a suction lift. ¶Your engineers will appreciate all these refinements in construction which give the assurance of continuous heavy duty. ¶Our consulting service has helped many plants in solving pumping problems. Write to us for information.

Since 1864 Builders of Dredges, Centrifugal Pumps and Steam Engines

MORRIS MACHINE WORKS

200 Genesee St., Baldwinsville, NEW YORK

(Continued from Page 32)

sealed at the press-lead with the two glass members of the stem. Then the hooks are inserted on both ends of the bottom rod part of the stem, and on these hooks, the filament of tungsten wire is wound—and the finished whole is called the "mount."

Then a short piece of tubing is fused on the extreme top of the bulb for removing the air later. The ragged, surplus neck of the bulb is removed and the bulb is placed over the filament mount. Hot flames are directed against the neck of the bulb on all sides; the neck draws in and forms an air-tight joint with the flange of the filament mount. Next the bulb goes to the exhausting machine where it is exhausted and sealed, or exhausted and filled with inert gases and sealed—depending on the type of lamp it is to be.

The lamp is then lighted for the first time, a felt separator preventing short circuiting of the lead wires. If it stands the tests, the base is fastened to it by cement and the lead wires are soldered to the base. And the lamp is ready for labeling, packing and distribution to the users of artificial light.

The Ever Widening Field of the Typewriter

(Continued from Page 17)

eral copies or originals simultaneously written. It naturally followed that the business world realized writing machines were a necessity.

"Four great fundamental steps have marked typewriter development:

1st—To write rapidly *by machinery;*

2nd—To write *visibly;*

3rd—To write *without noise;*

4th—To so reduce the weight and size of writing machines as to make them companionable—conveniently carried wherever any user may go.

"With quiet operation and portability, the field of the writing machine becomes vastly enlarged—almost without limit—not only in the office, but in the home, the school, in hotel rooms, on trains and everywhere.

"You ask of me, what may now be the 5th or next great further step in the development of writing machines?

"Certainly no limit can be placed safely upon the possibilities of invention. Marvelous, almost beyond expression, have been the telephonic and radio achievements of very recent years. Think of the means by which a man in Honolulu listened to the conversation of a person in New York with one in Paris! Will automatic writing machines some day both write and receive such messages with guarantee of accurate transcription? Will the ether waves of the radio mystically touch and guide my writing machine keys, inspired from afar by friend, associate, correspondent; and may I return messages to them in this way?

"Will the airplane and the flying boat be followed by the flying auto, so light and free as to hop from the street as nimbly as the dove takes wing, and as easily alight on street and roadway, folding its planes like the grasshopper into compass narrower than a runabout? Certainly the flying auto would need little added weight beyond an airplane and no added motive power for running on land, simply using its flying motor and air propeller and its light landing wheels provided with steering gear and brakes.

"Some day our coal supply will be exhausted. Then will the vast hydro-electric energy of the world supply us with heat, light and power far more satisfactorily, and will the unlocking of thirty-five millions of horse-power from a single river in Africa; fifteen millions from a single river in South

(Continued on Page 36)

Digitized by Google

USER REPORT SERIES

2

Written by Users of B-G Machines Audited by H. P. Gould Co.

No part of this report written, altered or even seen by Barber-Greene

Finished report as quoted here is only report which was delivered to us.

Cut Handling Costs In Half
Eliminate Shut-Downs Entirely



Sand From Bank to Plant

"Since installing a Barber-Greene Loader and Belt Conveyor, we have ***never had to shut down our plant for lack of material,*** though such shortages formerly caused expensive tie-ups. These ***machines are displacing 6 men, and saving $3902.14 a year in wages alone.*** Though used only 3 or 4 hours a day, they average 150 tons of material a day. The machines have ***also reduced our labor troubles,*** which were unusually serious because of the disagreeable nature of the work they have taken over," writes Mr. W. H. Crume, president and general manager of the Crume Brick Co., Dayton, Ohio.



Finished Product from Plant to Car

"When digging into a soft bank, the machines can handle a yard a minute, of material weighing 2700 to 2800 lbs. to the yard. An operator and helper easily handle the two machines, and have enough time to look after the stationary conveyor. The total annual operating cost of the two B-G machines is $3297.86, which amounts to only $.0732 per ton.

"The Barber-Greene Company's field engineer has been of considerable assistance in solving our problems, and the company has always given us excellent service. We would buy more of their machines without hesitation."

Write today for report number two, which gives complete cost figures on the operation of B-G Equipment at the Crume Brick Company

Barber-Greene Company

470 W. Park Avenue, Aurora, Illinois

Branches in most Principal Cities

Note — We have literally thousands of photographs showing every possible application of our flexible standardized, portable conveyors and loaders. Tell us your handling problem and we will send an illustration of a similar installation. Or if desired, one of our engineers will call. No obligation. Our aim is to reduce your handling costs.

Digitized by Google



Tycos

TEMPERATURE INSTRUMENTS
INDICATING - RECORDING - CONTROLLING

PRICES

LOWEST when continuous service without repairs and economies effected by their use are taken into consideration.

To specific inquiries we give immediate attention.

Complete *Tycos* Catalogues await your request if made on firm stationery.

One lists instruments for steam and power plants, heating, ventilating, marine engineering.

—Another for industries depending on vacuum processes.

—Another for ice manufacture, refrigeration, cold storage and industries where the primary requirement is low temperature.

—Another catalogues instruments used in brewing, bottling, malting, distilling.

—Another covers canning, packing and allied industrial requirements.

—Another is devoted solely to gas works, by-product coke ovens and gas power plants.

—Another, industries in which the principal operation requires the use of long stem, high temperature thermometers.

—Another is for the baker, confectioner and allied industries.

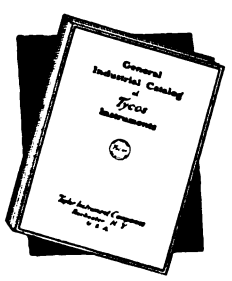
—Another covers a complete line of regulators for controlling temperature in enclosed spaces.

—Others are devoted to milk industries.

—And still others to thermo-electric pyrometry.

Taylor Instrument Companies
Rochester, N.Y., U.S.A.

Theres a *Tycos* and *Taylor* temperature instrument for every purpose.



(Continued from Page 34)

America; nearly five millions possible from Niagara Falls—the latter equal to all power now used in the United States outside of steamboat and railway transportation—and millions from the tides of the ocean—two hundred thousand horse-power now in progress of realization, in a simple, practical manner, from the 65 feet rise and fall of tide at the Bay of Fundy—will not these and other untold resources of nature make vastly greater demands upon the writing machine; and may we not hope that, departing from engines of destruction, the world's mind may forever turn to the arts and pursuits of peace, generous prosperity and good will?

"It must if civilization is to endure."

Wages and Wage Cuts

(Continued from Page 16)

A hazy idea flitted through Jim's mind that there were several hundred more workmen who had helped to buy that car. It did not enter his mind that the profit was comparatively small on each man, and that only the number of the force given employment made it possible for the owner to live according to a legitimate income from his creation.

Jim had nothing to add to his companion's lament, and left him to enter the grocery store where he traded. The merchant had heard of the wage cut and was as bitter as any of them.

Jim left the store gratified at the merchant's sympathy, and utterly unaware that he was also laboring for the storekeeper; but that while the merchant was simply catering to his wants after the employer had furnished the necessary money, the latter had actually provided the means to earn a living. It was all a matter of view point.

Jim made his way home, and with fears of the effect that the news of the cut would create, entered the bare hall of a three-family tenement. He was scarcely inside the kitchen door when a tall, slightly built youth of fifteen greeted him.

"Was made a first class Scout today, Pop!" he cried gleefully. "Passed all the tests without trouble!"

Jim made no reply, but glanced toward his wife, who was putting the noonday meal on the kitchen table.

"What's the matter?" she asked, glancing at his sober face. "You are about as sociable as a sore bear!"

"We've been cut again!" he blurted, eager to get it over with.

She was in the act of pouring out his tea. She stood regarding him with unbelieving eyes, the tea pot still held in her hand.

"We can't live on your money, now," she said, still staring at his averted face. "How much did they cut you?"

"Ten per cent," he replied.

"Do you know what that means?" she asked slowly.

"Yes," he replied. "It means that we must live off of twenty-two and a half a week."

His wife set down the tea pot, the tea unpoured, and going to the kitchen shelf, took down a small account book. While Jim watched her she jotted down a number of items, thinking long over each one. She finished, and shoved the book toward him. Then she said bitterly:

"That's what it costs us to live. Here is our living expenses under the new rate."

Jim read what she had marked down.

"Rent, twenty-five a month $4.25 a week.

Coal, one ton lasting six weeks, @ $15 a ton.....	2.50
Insurance	1.00
Store bill for five people; meat, groceries, milk, kitchen incidentals	15.00
	$22.75

"Why, we can't live on that!" said Jim slowly, with a sinking feeling at the realization. He pushed aside his plate and rising to his feet he started to pace the floor.

"It means," she said dully,

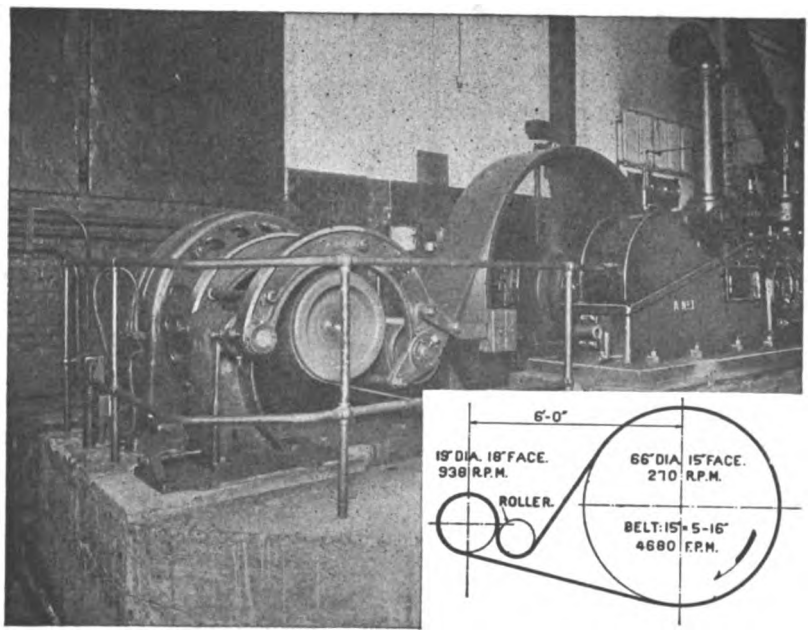
(Continued on Page 38)

Digitized by Google

THE KORAP *LENIX

will add

MORE POWER TO YOUR DRIVE



150 H. P. Motor Driven Air Compressor.

An appreciable portion of the power transmitted by an ordinary open belt drive is wasted through belt slippage. This waste is *a real* money loss, but it is a loss that is eliminated by the KORAP-LENIX Drive,

Because

1. The KORAP-LENIX brings the larger parts of the hitherto unused surfaces of the belt and pulleys into working contact.
2. The KORAP-LENIX maintains constantly the proper tension in the slack side of the belt irrespective of atmospheric and temperature changes.
3. The KORAP-LENIX automatically follows the peaks and valleys of the load by a corresponding increase and decrease in the arc of belt and pulley contact synchronous with the variations.

Short centers, not only possible, but preferable, with the KORAP-LENIX Drive, save floor space, building space and belting.

By practically eliminating the initial tension of the belt necessary with ordinary open belt drives, the KORAP-LENIX saves in bearing friction, lubrication and renewal of bearings through the resultant minimized bearing pressure.

Less expensive, higher speed and higher efficiency motors or generators can be used with the KORAP-LENIX because of the higher pulley ratios.

The evidence is in booklet "SAVING SLIPPAGE & SPACE" which will be sent on request.

F. L. SMIDTH & CO., Engineers

50 Church Street **New York City**

* Improved LENIX Drive

Digitized by Google

G.P.&F. Service
Knowing How Since 81

STAMPINGS
SHEET METAL PARTS

A Specialized Service



G. P. & F. Service offers you a means of reducing the cost of your stampings and sheet metal parts, without lowering the quality of the product.

Our fifteen-acre plant and the experience of 41 years makes this service possible.

Send us your prints for estimates.

Stamping, Forming, Drawing, Punching, Pressing and Spinning—in Steel, Copper, Aluminum, Zinc, Brass or Tin.

GEUDER, PAESCHKE & FREY CO.
1450-1750 St. Paul Avenue
MILWAUKEE WISCONSIN
Detroit Office: 712 Dime Bank Bldg.



TABER-PUMPS

For Every Industrial Requirement

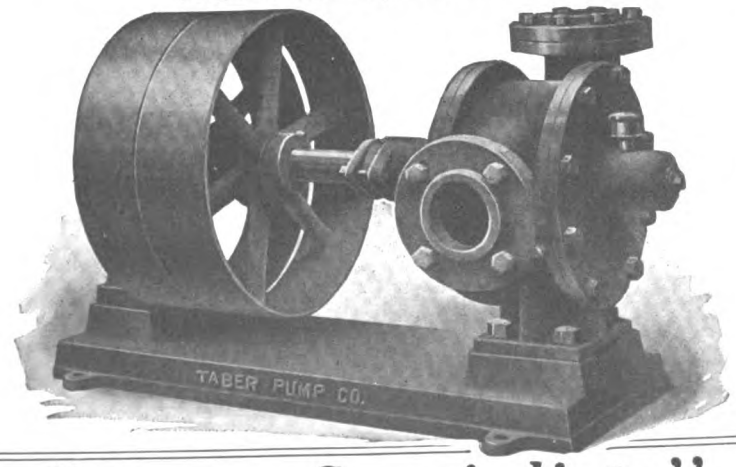
The experience of over 40 years, specializing in pumping problems for every conceivable industrial need, is at your service in the choice of the proper pump.

Our Rotory Pumps are universally used for the pumping of viscous materials such as heavy oils, tar, asphalt, molasses, etc.

We build ROTARY PUMPS with steam jackets when necessary.

Send for our booklet, which describes Taber Pumps in detail, both Rotary and Centrifugal

TABER PUMP CO., 308 Elm Street
BUFFALO, N. Y.



"Pump Specialists"

(Continued from Page 36)

"that we have got to look for a place of four rooms instead of five. It means no new clothing, no savings, and that Bob must leave High School and help out. Oh, what's the use!" she exclaimed passionately, on the verge of angry tears. "It's always the way. Always something coming up to keep you down. If it ain't sickness, it's lack of work, or laid off, or something all the time. Now it's this cut; just when we were barely keeping even, and by going without things we need. Do you expect me to keep house, pay bills, and raise three children on that money; with living what it is?"

She sprang to her feet and dashed at her housework. Her nerves manifested themselves in her slatting the cooking utensils down; the heavy, snapping descent of her heels upon the floor, and an angry snarl at the children, who were drilling under the direction of the elder boy.

"Lots of people live on that money," said Jim weakly, inwardly cursing the Boss and the profit system. "Seems to me if we run things right we could get by."

"Get by?" she sneered. "Can you feed five people, buy all the little things you need, like soap, blacking, starch, clothes-pins, and a hundred other needs for less than fifteen dollars a week? Can you get a rent fit to live in for less than twenty-five a month; unless you want to live in a tenement in the slums? Do you want to live like that? You, who's always bragging about your forefathers fighting in the Revolution? You might, but I won't! They can cut your pay, but they don't make any effort to get living down where you can meet it. It's all right for the Boss to cut, he don't understand or care how we are going to live!"

"The bills must come down," said Jim moodily.

"Then you'd better handle the money yourself," she said. "I'm sick of the house, the struggle, and everything connected with it. Damn the shops! You stick there, taking what they're a mind to give you, and you don't know enough to get out. Other men provide for their families. You're satisfied to live like a ditch digger. I won't. You either get another job and provide for your family, or I'll go out to work and let the house go. Suit yourself!"

"What can I do?" he cried, getting angry. "I work every day there is work, and bring home my money. I don't even keep a dollar for myself. Good God, you'd think I was doing it on purpose! I'm doing the best I can!"

"That isn't much," she retorted. "Get out of that shop and into something else. Get another job. You'll never amount to anything there, and we'll always be living the same way. Nothing to look forward to but debts, poverty and a bare existence!"

"It's all right to yell, get another job!'" stormed Jim, seeking to defend himself by anger that he did not now feel. "How will I, when we owe the grocer? The rent is always a week or two behind, and it costs money to move. Where will we get the money to move, pay up our store bill, pay rent in advance, and get settled? We can't stay even as it is."

"I don't care what you do," she snapped. "Other men do. What's your Unions and things for?"

Jim did not answer. He picked up his cap and started back to work. He had proceeded but a short distance when he was joined by the boy, Robert.

"Pop," said Bob, "you'll come to the Scout's meeting, won't you? I'd like you to see us go through our work."

"I don't know, Bob," said Jim shortly. "I won't make any promises now."

"I don't understand why other fellow's fathers get around with them,' said the youth with a sigh. "George Scott's father goes with him everywhere. They go out in the car together, fishing, ball games, and everything. You never go anywhere."

"George Scott's father works in an office," said Jim. "He works eight hours a day, and is on a salary. That's why he feels that way. He wouldn't care much about anything, if he worked day after day, year after year, always in debt, and always worrying about lay-offs and sickness; and have hell raised with him

(Continued on Page 40)

Digitized by Google

Group Training For Foremen

——*Sound and Effective Methods*

DURING the past four years the Business Training Corporation has conducted *not less than 80 per cent* of all the group training for foremen carried on in the United States.

More than five hundred industrial companies have entrusted this important factor in their development to our staff.

This record is the result of a steadily growing reputation for sound and effective methods of training.

Success naturally encourages imitation—sometimes without adequate experience or facilities.

If you are interested in strengthening your supervisory force—the real underpinning of your whole organization—write today for our booklet called "Making Better Foremen." It is a practical and helpful treatment of a subject which is of vital interest to those executives who think more than thirty days ahead.

Business Training Corporation

"Greater Team Work Through Group Training."

185 Madison Avenue *New York City*

Digitized by Google

MANAGEMENT READS RESULTS FROM THEM

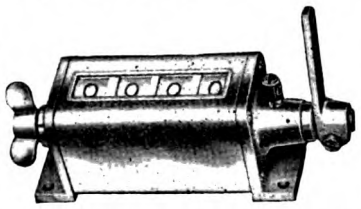
However you set about to reduce labor-costs, you must start with what the operative produces, and work toward what he *ought* to produce.

Veeder Counters tell what you're now getting, and indicate what you *ought* to be getting from the operatives at the different machines.

As automatically as they give you the records—

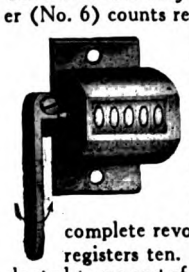
Veeder
COUNTERS

wipe out the discrepancy between the production you now get and *should* get. The worker at the Veeder-equipped machine knows "*results count*" in his production-record. Hence the record soon shows improvement!



The above Revolution Set-Back Counter records the output of any machine where a shaft-revolution indicates an operation. Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figure-wheels, as illustrated, $10.00 —subject to discount. *Cut less than one-half size.* Set-Back Rotary Ratchet Counter, to record reciprocating movements as on punch presses, $11.50 (list) Smaller counters at prices from $2.00 up.

This small Rotary Ratchet Counter (No. 6) counts reciprocating movements of the lever, as required in recording the output of small machines. When the lever is moved through an angle of 40 to 60 degrees, the counter registers one. A complete revolution of the lever registers ten. This counter is adapted to no end of counting purposes, simply by regulating the throw of the lever. Price, $2. (*Cut ⅓ size.*) Small *Revolution* Counter, to record revolutions of shaft, also $2.



Counters for practically every type of machine are illustrated in the Veeder booklet. A copy should solve any counting problem—and it's free.

The Veeder Mfg. Co.,
63 Sargeant St., Hartford, Conn.

(Continued from Page 38)

besides about things he can't help."

Jim walked along in silence for a moment, then continued:

"I'm like thousands of others with families. I've lived my life; got into the place where I'll always stay. The only thing I can do is to change jobs, and then one would be as bad as another. They're paying as much now where I am as any place. You can't make your mother see that. It wouldn't do any good to change."

The boy was thinking intently. "Well," he said finally, "it isn't enough to live off of. Ma may not know much about the different shops and what they pay, but she does know what it costs to run the house."

Jim grunted, and leaving the boy, turned toward the shop.

During the afternoon, the union man came around and informed Jim that there would be a meeting that night, open for all. He urged Jim to be present and to bring all the men he could gather.

Jim returned home that night to be greeted by a sullen, unspeaking wife. He ate a solitary supper, frowned upon by the two younger children, who seemed to side with their mother, and only an expression of would-be comradeship in the elder boy's face placed Jim as one of the clan. The harassed man finally left the house for the meeting. The logic vented there, delivered to and from the worker's viewpoint, confirmed Jim's opinion that a strike was the only cure for economic ills.

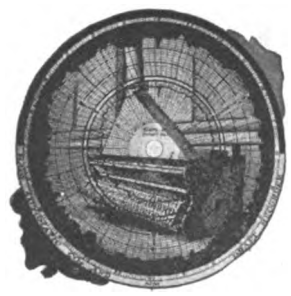
The men organized into a unit, the Union being shoved aside for the impromptu confederation. A committee was appointed. Jim was made a member.

The next day the men waited upon the manufacturer. The executive, after vainly striving to interest them in his problems, was forced to fall back on the one fact he knew; either a reduction of costs or a closed shop. He stated this, and stood by the creation he had built up through long, lean years. It was too late. Nothing remained but the evident misunderstanding all around and the possible strike.

The exec[illegible] Jim to his office. [illegible]er en-

Whether Hand Fired or Stoker Fired

You can see thru the Hays Chart







What is happening in the Boiler Room

With coal so expensive and hard to get and with freight rates so staggering it behooves every user to consume less by burning it efficiently.

To enable you to burn your fuel efficiently you must know at all times what you are doing and the reason. A daily chart from

The Hays Automatic CO₂ and Draft Recorder gives you this information more accurately, and more promptly than does any other instrument.

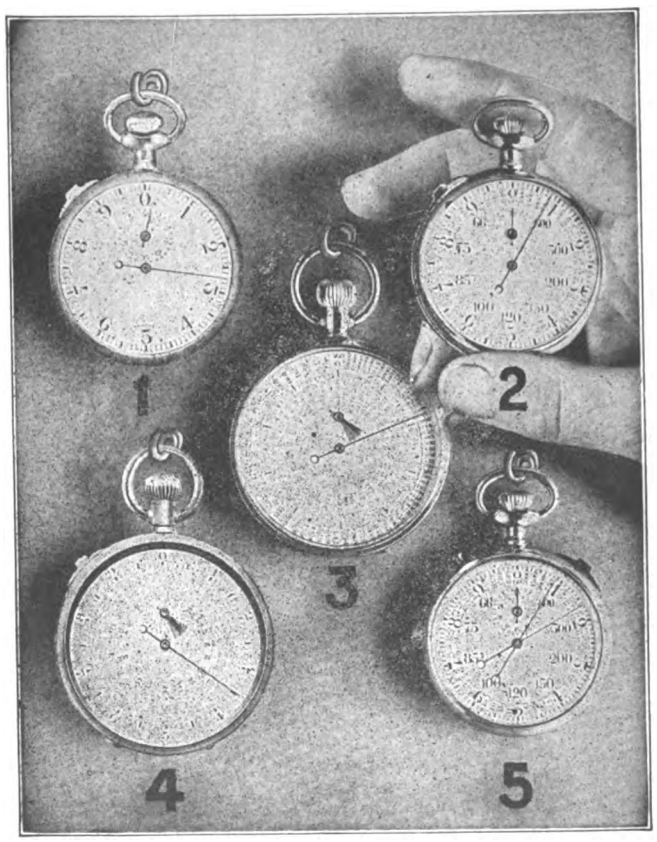
A single Hays Recorder has made it possible for The City of Moorehead, Minn., to cut fuel bills 15% and save from 15 to 30 tons of coal every month. Capitol Elevator Co. at Duluth report savings of 19%. Ft. Scott Public Utilities reduced their oil bill 14%. Plants all over the country are being guided to economy by Hays Automatic Co₂ and Draft Recorders and "Hays Service."

Literature for the Asking

The Jos. W. Hays Corporation
Combustion Efficiency Appliances

1038 E. 8th Street, Michigan City, Indiana

At Last Time Study Watches for Every Job



At last time study watches have been developed to where they can apply to every job in the plant—do their own calculating for production figures—give you direct results with absolute accuracy. Your job may be a simple time analysis—or a complex problem in piece work rate setting or a bonus system—there's a watch in this illustration that exactly fits your needs.

For Locating Wastes
Computing Costs
Setting Rates for Piece Work
Establishing Bonus Plans

You can use any one of these watches for every kind of time study. But each has special features that facilitate certain types of work. No. 1 has a plain decimal dial with the "take out time" feature. No. 2 has, in addition, direct readings in production per hour up to 1 minute jobs. No 3 carries the same readings up to 5 minute jobs, in seconds and half-seconds. No. 4 gives all readings in decimals and shows production figures up to 3 minute jobs with a special arrangement for timing jobs up to 30 minutes. No. 5 is the "split hand" watch with the "take out time" improvement which now permits careful studies of multiple operations and parts of operations. Each watch has this "take out time" feature.

Any Watch Sent on Approval to Responsible Concerns

Pick the watch that fits your job. We will gladly send it with a descriptive pamphlet on its use to any responsible concern on approval. Put it to any test you wish—prove its advantages in facilitating the work and guaranteeing absolute accuracy. Each watch is backed by our unlimited guarantee. Write us today for the instrument that fits your requirements—or in case you desire our advice, tell us the class of work you are doing and we will ship you the watch to meet your needs. No obligation. Write today for detailed pamphlets, or for pamphlet entitled "More Jobs for the Factory Stop Watch."

MORTIMER J. SILBERBERG CO.

Peoples Gas Bldg. Pioneers in Manufacture and Sale of Time Study Watches **Chicago, Illinois**

Digitized by Google

deavored to convince the silent, bitter man of the futility of pounding against him, personally, when the world and markets were at fault. Jim listened and smiled. Back home was a sullen and discontented wife, unpaid bills, want, discord, and lifelong worry. There was nothing for Jim to reason about. The only thing that interested him was the cost of living and how to meet it. Let the Boss pay enough to meet this need. Simple.

"A strike means danger to innocent people, Jim," said the executive. "Arrests, perhaps; damage; loss of wages; and possible loss of life. You know how those people act that you are banded with. They have no idea of American loyalty and interests."

"Well," said Jim pointedly, "it was you that brought them in, pay them less wages than a white man can live from, and hire their men, women and children to work in the shop. You don't see the American element living down in Factory districts. When you do, you'll get what the others give you: damage, rioting, and hard-fought strikes."

"But you are an American?" exclaimed the executive.

"Yep, and that's what I'm striking for," said Jim; to stay one!"

"There is no need in my talking to you," said the other sharply, "You do not understand!"

"Neither do you," retorted Jim, who felt that his job was already gone. "You only understand that our pay must be cut; but we understand that we can't live if it is. Not like decent, white men. What comes between them two points, I don't know."

"Very well," said the executive. "I'd think it over if I were you."

He dismissed Jim with a nod, and pressing a button on his desk, stared dully ahead of him.

The strike was called for the next morning. The walkout was practically complete. A few workers remained in the shops; those who for various reasons did not care to, or would not, strike.

Saturday morning found conditions about the same.

Sunday, Jim, who was still bickering with his wife over their affairs—the strike and its consequent wage loss coming as another bone of contention—decided to visit a school chum and former shop mate, who lived in a small manufacturing city some fifty miles away.

It proved a difficult task to get the money from his wife for the journey, but she, seeming to feel that it might lead to a change for the better, at last consented.

Bob saw Jim off on the trolley. The youth called out not to forget the get-together meeting for Monday night. He waved a friendly hand as the car moved away. Jim did not return the wave. His mind was on his problems. He missed the hurt look on the boy's face and the lad's sigh of unfilled comradeship.

Jim had had the foresight to send a telegram ahead, and found his friend awaiting him. "You're looking fine, Fred," he cried, as he grasped the other's firm hand.

Henley smiled. "Good living, Jim," he replied, with a keen glance.

Jim felt the look. To him, Henley represented success and peace; he, himself, discouragement and failure. Yet Henley was also a wage earner.

"What's the trouble at Watertown, Jim?" asked Henley, as they walked toward the later's cottage, showing cool and restful against its surrounding greens.

"They cut our pay ten per cent," said Jim, with quick bitterness. "The men can't live on it and they went on strike. It cuts me to twenty-two and a half a week."

"I make twenty-five here," said Henley quietly.

Jim glanced at him in surprise.

"Fact," said Henely. "It isn't what you make, it's what it costs to live. Living is pretty reasonable here."

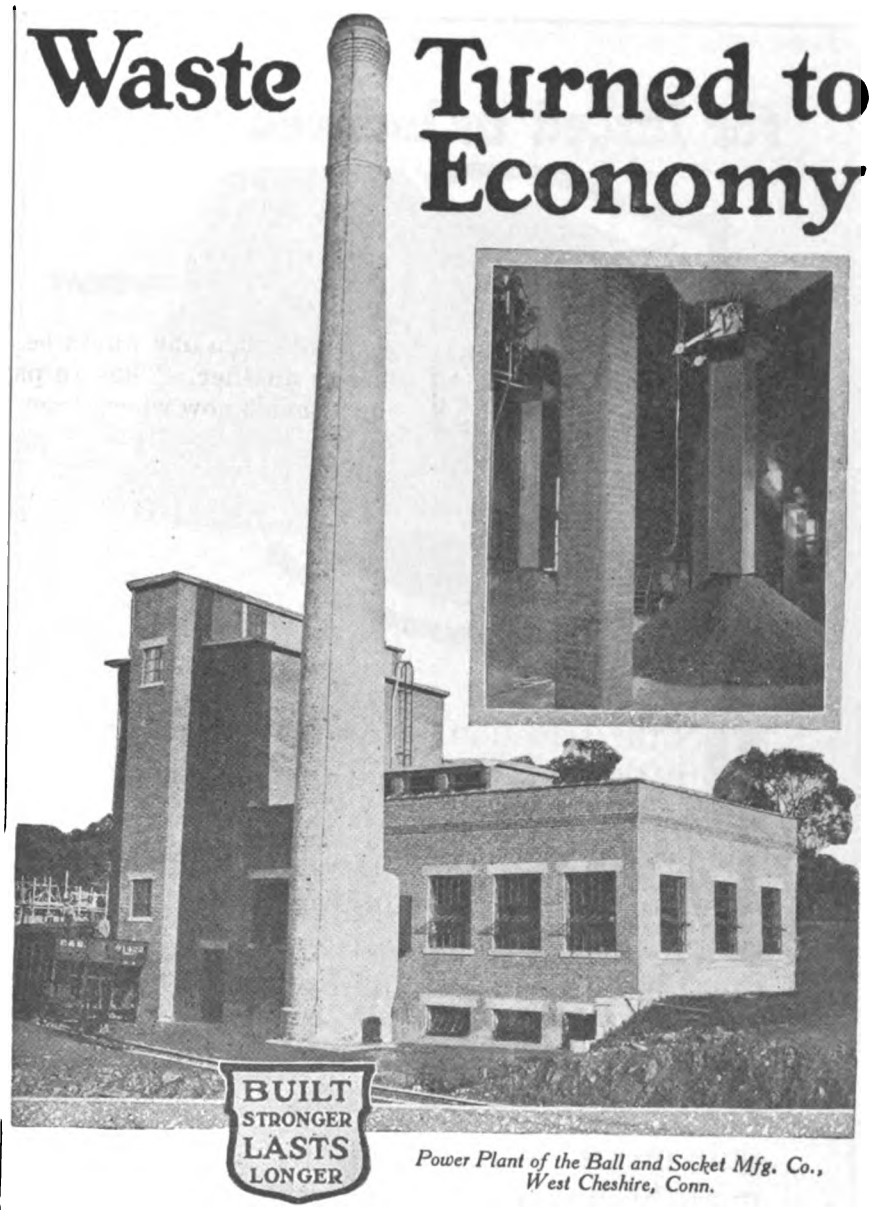
They arrived at the cottage, where Jim was greeted by a brisk, smiling housewife.

"Jim can't understand how we can live on twenty-five a week," said Henley, lightly. "He says a man and wife and three children can't do it."

"Not and live white," said Jim, ignoring the evidence before him.

"Well, we have three about the age of Jim's boys," she re-

Waste Turned to Economy



Power Plant of the Ball and Socket Mfg. Co., West Cheshire, Conn.

Imagine the saving over old, wasteful, manual methods by efficient G-W coal handling machinery in this plant!

Coal cars dump directly into truck hopper, from which a reciprocating feeder loads an elevator conveyor having a capacity of 50 tons per hour. The coal is elevated vertically 50 feet, then carried 30 feet horizontally over the 200 ton concrete bunker. It is distributed to the proper bin by a rack and pinion gate, and fed directly to the boiler room floor by two down spouts with regulating valves.

G-W Power Plant Engineers will be glad to study your coal handling requirements with you and help effect economies that reflect in profits.

The Gifford-Wood Company specializes in elevating and conveying machinery for all lines of industry, including coal crushers; pockets, (wood, steel, concrete; rectangular, silo), screens; elevators; conveyors; hoppers; locomotive coaling stations; elevating and conveying equipment for ashes, stone, sand, gravel; pivoted bucket carriers, warehouse conveyors, portable conveyors, wagon loaders; car unloaders; friction clutches, hoists.

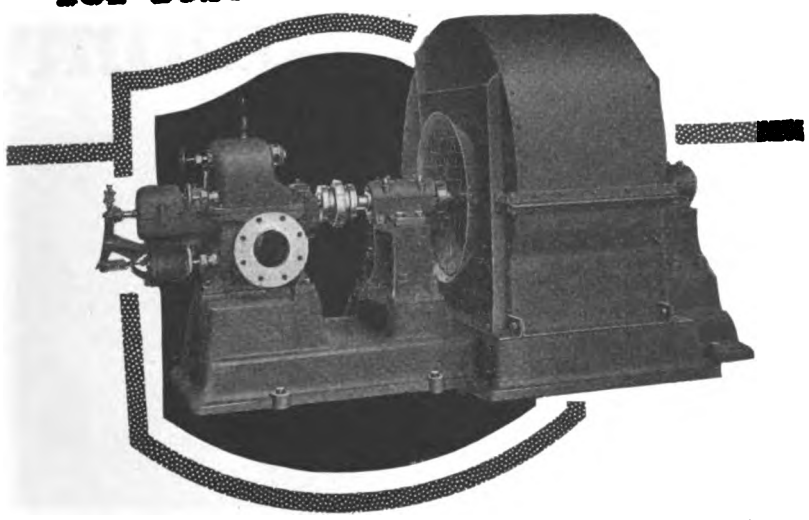
Main Office and Works, Hudson, N. Y.
Branches: New York, Chicago, Boston, Buffalo

Gifford-Wood Co.

MATERIAL HANDLING EQUIPMENT

Digitized by Google

for Forced or Induced Draft



IN the selection of draft equipment it should be recalled that the most essential characteristic of the driving element is adaptability to speed regulation. When regulation is obtained by throttling the air from the fan there is a loss in efficiency which cannot be recovered. Regulation which varies the speed of the driving unit to compensate for the variety in draft requirements avoids throttling and permits higher overall efficiency. The Terry turbine has the utmost flexibility; in other words, its speed may be regulated to meet the exact requirements of the blower. When used in conjunction with mechanical stokers this speed regulating may be done automatically so that the best combustion efficiency is constantly maintained. Of the 8000 or more Terry turbines now in operation, 1800 of them are used for driving blower equipment. This is why designing and operating engineers say that because of such broad experience you cannot go wrong if for your forced or induced draft service you

Specify

T-773

THE TERRY TURBINE

Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co. Terry Sq. Hartford, Conn. U.S.A.

plied, "and we do it nicely. Of course, living is higher at Watertown."

They left her to prepare dinner and went out on the wide porch. Sitting in deep, comfortable chairs, Henley listened to Jim's troubles.

"It's lack of understanding on both sides, Jim," he stated, after the former had finished. "Four years ago we were in the same boat. At that time, wages were going up all over the country, ours slowly. We manufacture a line that did not fit in with war needs and business was slow. We got the men together and it developed into strike talk. There was a half-hearted attempt to meet us on the part of the manufacturers, but it got nowhere.

"Finally, one of them called in one of the leading agitators and got him talking. The worker told him a few things. Instead of hitting the shop owners he expressed his opinion of the town merchants, who were boosting up prices."

Henley paused and idly watched two youngsters race after a large rabbit, that seemed to take as much delight as the children in the merry chase.

"Well," he resumed, "that meeting and talk developed into shop councils where we men could have our say. There we heard things we never reasoned about before. Bristol, here, was a town, our birthplace in many instances, and a permanent thing. It was the town that affected us. We prospered as it did, lost as it suffered. Bristol depnded for its prosperity on the factories and the workers. There was no question about that.

"The third angle of the necessary triangle was the merchants, landlords and professional men. If doctors charged three dollars a visit, landlords thirty and thirty-five a month, and the merchants all they could grasp, then it was up to us to get more money. We figured that what affected one hit all. Let the merchant overcharge or profiteer and it meant that the manufacturer must pay more to his help. Let the shops cut below a living cost and it meant the merchant would suffer in his business. Let the workers strike, and all three lost.

"Of course, the logical thing to do would be for all three to meet in Council and work together. This being too sensible to grasp and follow without proper education, we did the next best thing. Bear in mind, that this was what the Bosses were hearing from the men. We had heard their problems; namely, poor markets and possible shut downs unless demand could be created and maintained by low production costs and attractive selling prices. Now, they were hearing ours.

"As a result of this clearing up, the manufacturers kept a close eye on the local market. Let coal get beyond the workers and they bought in carload lots and sold to the men. The same with potatoes, shoes, gloves, clothing, groceries, and a host of other needs. This acted as a brake on such as were inclined to profiteer, and held down the cost of living.

"The consequence was that the men worked for less money than other places, but got along better. It was a case of working together, men and shop owners, with such of the merchants that had the welfare of Bristol at heart also co-operating."

"You don't get that back home, said Jim slowly. "That's the trouble. Our pay is cut, rents are high, living stays up, and nobody, except the man that works for a living seems to care."

"It's simply lack of team work," said Henley. "You can't expect to understand the bosses' problems by listening to labor delegates, or he to understand yours by taking in Chamber of Commerce reports. That's what Councils are for: understanding."

"No faith in them," said Jim promptly. "Another catch-penny scheme of the Bosses."

"Have you, right now, and striking, any understanding of your boss's problems; why he made the cut?" asked Henley.

Jim had not, but he started to make a parrot-like speech about the damnable profit system.

"Neither has he of yours," said Henley, cutting short the other's flow. "If he did, he would have found some way of getting together."

"Then, there's the wife," said Jim. "She's always rais-

(Continued on Page 44)

Digitized by Google



Showing the manner in which belt conveyors can be installed. Note the conveyors hung from ceiling as well as conveyor to the right placed on floor.

Why Did The Diamond Match Company Equip Their Plants with Conveying Systems?

Because they realized that efficient handling of the raw materials entering into their finished product through the various operation stages meant increased production.

Production of a product has its inception the moment raw materials are received and is not completed until the finished product is in shipping room.

Raw materials, products in various stages of completion and the finished product should be handled mechanically in order that production be increased.

A conveying system to be efficient must be designed to conform with individual requirements. Your method of manufacture must be studied carefully in order that the proper system can be developed.

We will gladly have one of our conveyor engineers call and make a survey of your handling problems. Write us at once. This service does not obligate you in any manner.

SAMUEL OLSON & COMPANY

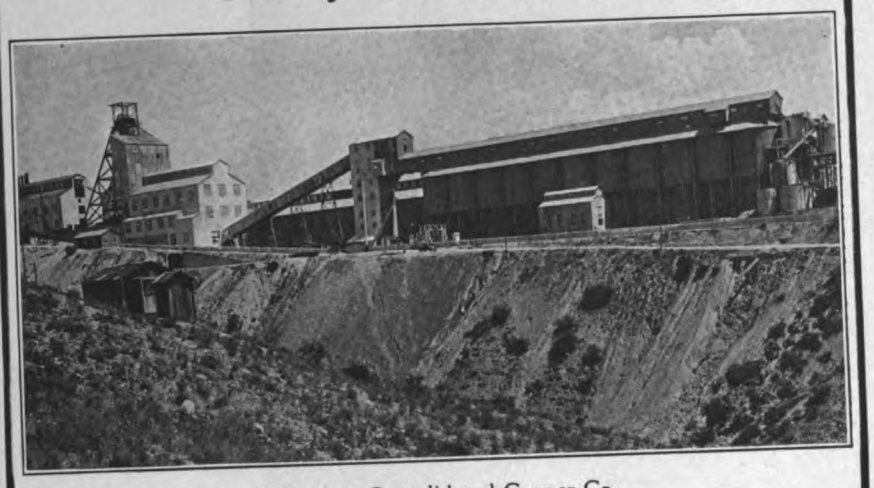
2428 Bloomingdale Ave.
CHICAGO, ILL.

200 5th Ave.
NEW YORK, N. Y.

Digitized by Google

23 Merrick Conveyor Weightometers

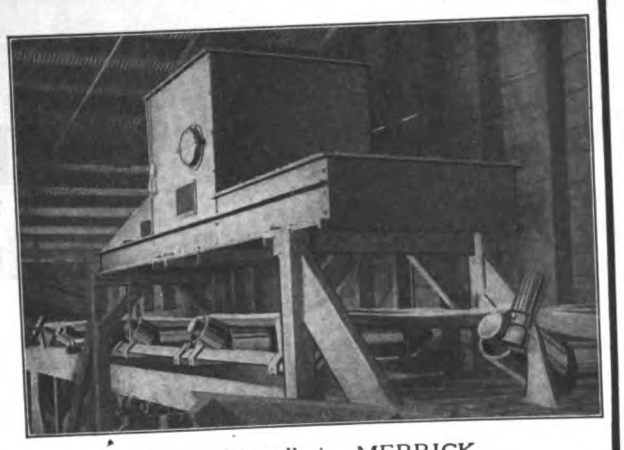
Weighing Ore while in transit over Belt Conveyor at this plant.



Inspiration Consolidated Copper Co.
Inspiration, Arizona

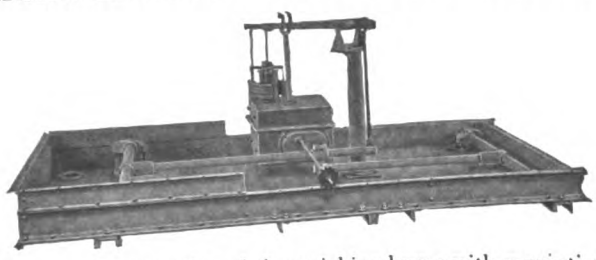
No matter what your conveyor handles whether Ores, Concentrates, Coal, Coke, Cement, Stone, etc., THE MERRICK CONVEYOR WEIGHTOMETER will meet your requirements successfully and with an accuracy demanded by engineers, and weighmasters.

No weighman or other attendant required.



Typical installation MERRICK CONVEYOR WEIGHTOMETER

GUARANTEED AND PROVEN 99% ACCURATE



Showing the mounting of the weighing levers with connection to the weigh beam and integrator box. Casing removed.

The WEIGHTOMETER is used by hundreds of concerns for checking incoming and outgoing weights as well as for production.

MERRICK SCALE MFG. COMPANY
186 Autumn Street, Passaic, New Jersey

(Continued from Page 42)

ing Cain the way things are going. I get sick of the whole thing. She takes it out on me for what the Boss does. I feel more like damning them than meeting them."

Henley chuckled. "I went through it," he said cheerfully. "It's simply nerves and the effect of the struggle. Have a steady job, so far as any shop job can be called steady, wages that will keep a decent home, and the right working conditions, and you will find most women are contented. I know mine is now, and we're getting along better than we ever did. She's another one of the team, either working with the Boss because home is a real home, or fighting against him when it is not."

"You might get all this in your Councils," said Jim doubtfully, "and you might get a lot of hot air that you know is Bull. How about real action?"

"I'll give you an instance how ours works," said Henley promptly. "The Kendal Company, here, had a large tract of idle land. Learning the want of the men for gardens, they staked off a big tract in plots, ploughed them at a nominal cost, and rented them to the men at a low rental.

"All the plots were grabbed at once. Any evening, or Sunday and Saturday afternoons, you could find the fellows out getting fresh air, sunshine, and working with their families. It meant health, a saving on food, and contentment.

"This same firm, seeing the need of homes for its help, gave a plot of good, high, and tillable land to such of its help who would start a home. They also held the next lot in case the home builder wanted to enlarge his holding. The latter was sold at a very reasonable sum, and many took advantage of the opportunity to get their own place."

"But that is simply because this particular firm did it," said the doubting Jim. "It's a sort of welfare scheme."

"Nix on that stuff," said Henley quickly. "We're off that stuff. We are not children for a firm to father. The manufacturers get our viewpoint and problems, and we get theirs. Understanding each other, it simply means working together for mutual help. No welfare about that. Just plain common sense and coöperation."

"It will never come in our town," said Jim hopelessly.

Henley remained silent. "How's the name-sake, Bob?" he asked suddenly. "I sure admire that lad. He is one boy to be proud of. That kid will amount to something."

"He's doing fine," said Jim, glowing. "Great kid for his age. I'll be glad when I can get to some place where we can live right. By the way, Fred, what's the chance for a job here? I'd sell off the stuff and start over if I could land something."

"No need to sell out," said Henley. "I'll lend you the money to move. I think I can manage to land you. I know that you are a good, steady worker, and we need help."

"Will this strike business hurt me here?" asked Jim anxiously.

"No, I guess not. But keep out of any mix-ups down there. Forget the strike. It leaves a bitter taste afterward."

"There will be trouble," said Jim, with a sober face. "The foreigners are mighty sore."

"That's the trouble," said Henley, shaking his head. "Pay below a decent living means the slums. A man will not work and go without, live in barracks, and see his kids running wild and unhealthy, and not be ready to topple over the system he thinks at fault. Here in Bristol, we are all Americans, and we are all Bristol boosters."

The call for dinner interrupted them. After dinner, Henley proposed a stroll through the town. The factories were in many instances surrounded by smooth, green lawns, and the dwellings showed the result of care and order.

"We're all gabby here," said Henley, as Jim patiently waited for the latter to finish a conversation with an acquaintance. "When you feel right with the world you don't have a chance to get moody and stick off in a corner, brooding. Between lodges, bowling, clubs, and other affairs, all of us are fans at one or the other."

Jim remained over night at Henley's. He was thinking of remaining over the day, but re-

Digitized by Google



EXTRA!

It's a PHOTOSTAT COPY

This company sends out important information to its salesmen in the form of PHOTOSTAT prints. PHOTOSTAT prints are quick, economical and error proof, not only for special rush bulletins, but also for copying sales reports, production charts, rush orders, drawings and blueprints.

The PHOTOSTAT copies directly on sensitized paper at original, reduced or enlarged size at a cost of a few cents per copy and at a possible speed of one print per minute.

The PHOTOSTAT does not require an expensive operator. Any office boy or girl can learn to run it in a few hours.

It will copy catalog pages, letters and other typewritten matter in a few minutes, whereas it would take a stenographer hours to do the same work at far greater cost.

It will copy drawings, pencil sketches or blueprints in a few minutes as compared with hours or even days of an expensive draftsman's time spent in making tracings for blueprint work.

For machines or service, write or telephone our nearest office.

PHOTOSTAT CORPORATION
299 STATE ST., ROCHESTER, N. Y.

98 Broad St., Boston
123 W. Madison St., Chicago
300 Leader Bldg., Cleveland
7 Dey St., New York City
510 No. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington.

Executive Office: Providence, R. I.

PHOTOSTAT
Trade Mark

flected that the boy, Robert, would be disappointed if he did not appear for the meeting of fathers and sons that evening.

He arrived back in the city to find the streets leading toward his shop thronged with people. He joined them. Walking briskly, he overtook his shop-mate, the socialist.

"Well," said the latter dryly, "it's started!"

"What is it?" asked Jim, his mind back in the town he had just left; "riots?"

"Yes," said the other. "Been going it all the morning. The fools, they'll never understand! Backing up against a wall when they have the ballot. It's like all strikes. Some remain in; some go out. They go hungry for a while, then go back more bitter than when they went out. If the next day was election they would vote the same old tickets. They'll never understand until they are starved into it!"

"Yes, they will understand, too," said Jim happily. "They'll understand when they are shown. "I've been shown, Joe. I'll admit, now, the men are wrong. And the Bosses who let them go out are wrong. It's lack of understanding on both sides."

They had reached the outskirts of the mob, that had gathered before the factory gates, and endeavored to work their way into the throng. Through the crowd, Jim could make out the upper parts of a police patrol and an ambulance.

"What's the trouble?" asked the socialist of a bystander.

"Some one hit with a brick and killed," answered the one addressed, striving to force his way ahead.

Jim and his companion finally made their way through the crowd. A lane was opening before them to enable two policemen, carrying a still form, to reach the ambulance. Behind them came two more officers, dragging an ill-featured foreigner, who wore the sullen dogged look of the vindictive.

"Poor devil," said the socialist, nodding toward the battered prisoner, "he don't understand, even now, what it is all about."

But Jim, with a heart that seemed to stifle him, under-



READ
"The Freight That Failed"
By Forrest Crissey

Every business man should read this illuminating article in the May 27th issue of The Saturday Evening Post. Mr. Crissey, in discussing the $100,000,000 annual freight claim losses, states that the use of stencils for addressing is a highly effective means of loss prevention. Read Mr. Crissey's article—then buy a Diagraph. Free trial in your own shipping room.

DIAGRAPH STENCIL MACHINE CORP.
1626 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities—see phone book.

THE SECRET OF FAILURE

Goods are sold below cost. If sold at prices higher than cost the seller cannot fail. Practically ***every business failure can be traced to either ignorance, apathy, or conceit, in regard to methods of cost and profit calculation.***

Most Factory Cost Systems are Misleading, Because Fundamentally Wrong

They encourage the sale of unprofitable business and discourage profitable business. All methods of "overhead distribution" have the same inherent weakness—they overcharge some items while undercharging others. The ***"material—direct labor—overhead" methods commonly practiced, is the greatest fraud ever perpetrated on industry.***

Prove Your Cost System Before Failure is Apparent

The cost of an item of product is the sum of the expenses involved in its production. ***Cost is always definite.*** If you distribute "overhead" on "direct labor," "direct labor and material," "man hours," or "machine hours," have a "general overhead" or a department overhead, "***beware.***"

Cost Engineering Determines Provable Costs



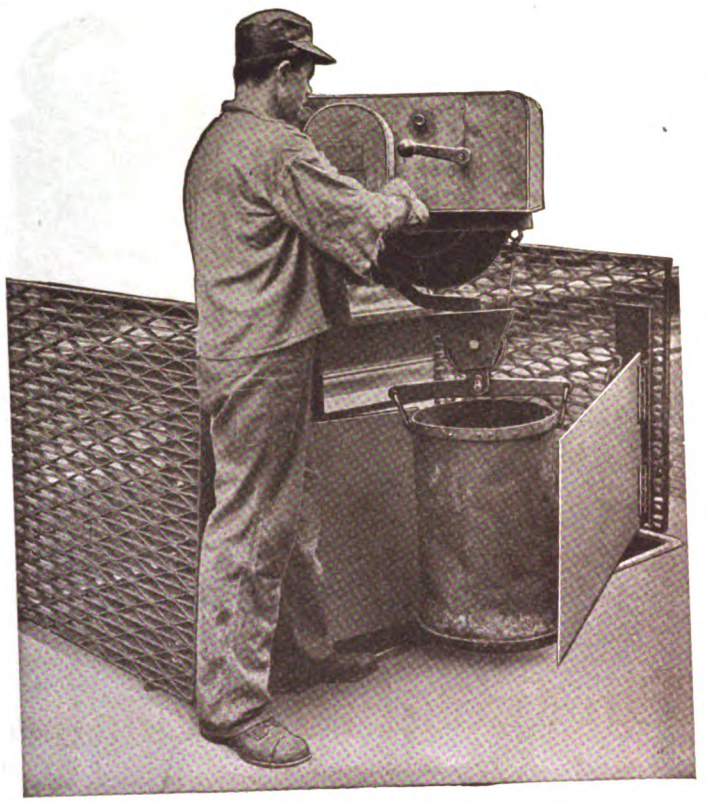
Cost Engineering (*Denham Methods*) is based on six fundamental principles. Seven hundred users attest the practicability and profitableness of its use. *It provides provable costs*, and all of the cost data essential to practical business management, without either red tape or approximations.

This FREE BOOK tells you about it.

The A-B-C of Cost Engineering, 116 pp. cloth, will be sent *without charge* to General Managers or Corporation Officers of manufacturing concerns. Send for it. *A Cost Engineer will call if you request it.*

—THE ORIGINATORS OF COST ENGINEERING—
THE DENHAM COSTFINDING CO.
· COST ENGINEERING SERVICE ·
437 Sloan Building CLEVELAND

Digitized by Google



This hoist raises and lowers 108 ash cans in one 5c kwh—

ONE of a series of tests made for us by the Sprague Electric Works to accurately determine the low operating cost of G&G Electric Hoists, shows that the G&G Hoist, at the Hotel Grand, New York City, raised 108 filled cans and lowered 108 empty cans at a current consumption cost of only 5 cents. This is the same Hoist that after 3 years' service, raised 3,500 cans of ashes (an accumulation during a heavy snow storm) in one continuous operation, and without the slightest mechanical failure. Height of lift is 21 feet 10 inches. (Where distance of lift is greater or less than at this installation, current consumption would vary.)

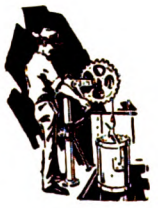


G&G Hoists are not limited to ash removal. They are made in various models, electrically and manually operated, to meet all kinds of hoisting problems in factories where the loads handled are under 1,000 lbs.





If you will tell us the kind of loads you are handling, the distance of lift, and something about the working conditions, our Engineering Department will be glad to recommend the proper G&G Hoist to meet your requirements and will quote you the cost of same. It places you under no obligation to ask for this information.



GILLIS & GEOGHEGAN

556 West Broadway **New York**

The G&G ELECTRIC REG U.S. PAT OFF Telescopic Hoist

stood.

Borne between the two policemen, their faces drawn and pale with emotion, was the limp, dead body of his boy, Bob.

Lights of the Dim Past

(Continued from Page 9)

questionable, as textiles were not yet invented. Probably the lamp burned over the whole surface, though of course some dried materials might have been added to the fat.

After the end of the cave dwelling period, thousands of years elapsed before we come to the beginning of civilization in Egypt. By that time, some six thousand years ago, the ice had receded far to the north, and Egypt had much the same climate as today. Pottery had been invented, and copper was both wrought and cast. Agriculture produced linen which was woven into textiles; the olive tree was common and its fruit was pressed for oil. All of these improvements had their influence on the lamp. It was made of pottery or copper, furnished with tow, or even a wick, and supplied with various sorts of oil.

In shape the ordinary Egyptian lamp was still much like a small cup without even a handle. At some time during the Kingdom of Memphis, however, an improvement came in by which a hollow handle was added to the bottom of the bowl, and a second bowl joined to the tube. This permitted the oil to be poured into the second bowl, and make its way to the tow of the first one even when the lamp was lighted. This form was highly useful in burning incense before the statues of the gods, and is several times pictured in the tomb paintings.

The commonest oil was probably olive, but the most highly considered was that of frankincense or myrrh, which was used in the most important religious ceremonies. This was imported from the "Land of Punt," by which was probably meant the district about the southern part of the Red Sea. The Egyptians even called Punt "God's Land" because they obtained from it the scented oils and incenses employed in their devotions.

Bitumen was known and used to some extent by the Egyptians, but whether for lighting is uncertain.

The Egyptian pictures illustrate both lamps which burn all over the surface as if they are filled with linen saturated with oil, and those in which the flame rises in a point as if it comes from a round wick.

Another lighting utensil which had come in, was the lantern. This was as yet merely a lamp which was protected by a house-like enclosure of pottery with the light showing through various openings. While colored glass was made at the time, it was used for ornaments, and is not known to have been employed for lamps or lanterns.

In addition to incense burning, lighting itself played an important part in the Egyptian religion. Hapdefae, for example, a governor in the Middle Kingdom, made contracts with the priests of Siut, to provide, among other things, for the kindling of the lights to illumine his ten funeral statues after his death, on the first and last day of each year, and at other festivals.

Herodotus, the father of history, described an Egyptian festival, in which an important feature was the illumination. As it had no doubt come down from time immemorial, his mention of the use of salt is particularly interesting, and his account worth repeating: "At Sais, when the assembly takes place for the sacrifices, there is one night on which the inhabitants all burn a multitude of lights in the open air around their houses. They use lamps which are flat saucers filled with a mixture of oil and salt, on the top of which the wick floats. These burn the whole night, and give the festival the name of 'The Feast of Lamps.'"

The Egyptians, during the

(Continued on Page 48)

Digitized by Google

BAR BUILDING

An Office Building for Lawyers

36 W. 43rd St., Through to 37 W. 44th St., New York

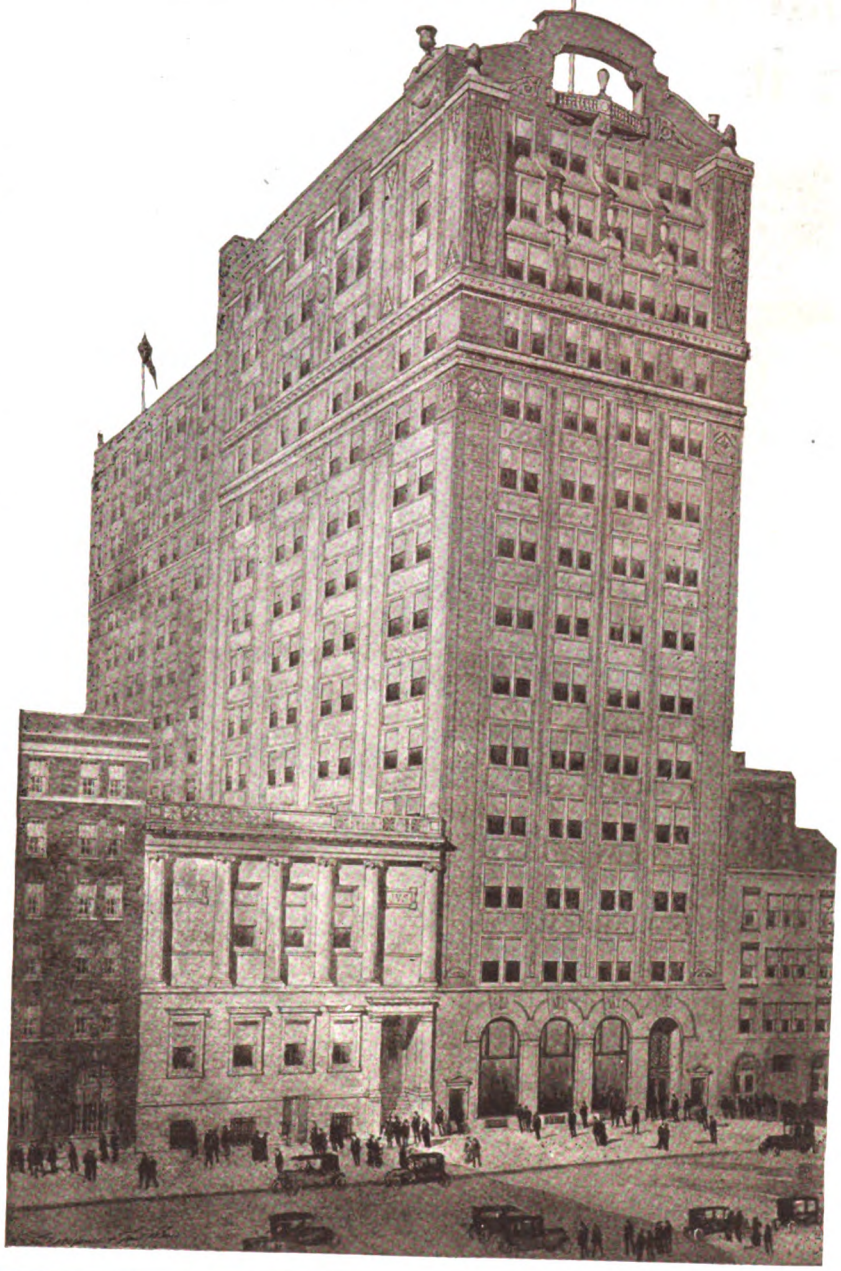
Charles L. Fraser
Building Contractor
372 Lexington Ave.,N.Y.

Knickerbocker Fire-proofing Company.
Floor Arches
and Concrete Works
56 West 45th Street, N.Y.

S. H. Sweeney
Heating & Ventilating
Contractor
213-215 E. 44th St., N.Y.

Fish Brick Sales Co.
Face Brick Contractors
25 W. 45th Street, N.Y.

Campbell Metal Window Co.
Metal Windows
8 West 40th Street,
New York



Gurney Elevator Co.
Elevator Contractors
300 Eighth Ave., N. Y.

South Amboy Terra Cotta Co.
Terra Cotta
Contractors
150 Nassau Street, N.Y.

Hay Foundry and Iron Works
Structural Steel
15 Madison Sq., N. Y.

Farnum Plumbing Company
Plumbing Contractors
370 Lexington Ave.,N.Y.

Construction and Foundation Corporation
Rock Excavating and Foundation Work
372 Lexington Ave.,
New York City

Severance & Van Allen ---- *Architects*
372 Lexington Avenue, New York City.

STORES and three lower floors will be open to commercial tenants. Directly connected with the House of the Bar Association which has over 2600 members. This is the first Professional Building for attorneys in New York. Space is being rapidly absorbed by prominent men of the Profession. This building will be an asset to your business. The large store and mezzanine has frontages both on 43d and 44th Streets and display along the entire course of the Arcade which connects the two Streets.

For further Information Address Burton Thompson, Managing Director

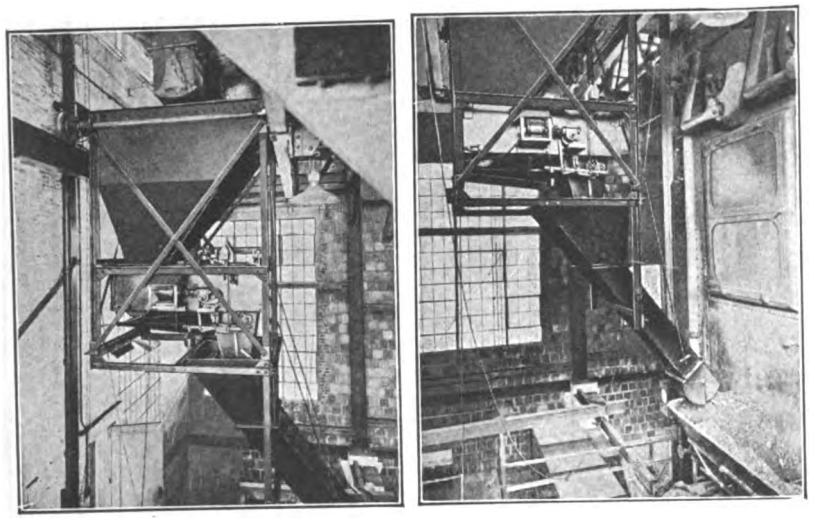
BAR BUILDING INC.,

372 Lexington Avenue, New York City

Digitized by Google

Get All The Power You're Entitled To

It's just as easy to save coal as to waste it



Use a RICHARDSON AUTOMATIC COAL SCALE to Register Your Consumption.

UNDER normal conditions a boiler ought not to burn more than an ordinary amount of coal. If it does, there is something wrong, soot, scale, holes in the fire, etc., to account for the waste.

A RICHARDSON will give you automatically a continuous and dependable check on the consumption of every boiler. If anything is wrong, the trouble can be detected and remedied at once, and

You'll Get better Evaporation and Save Money on Your Coal Bills.

Send for Bulletin 2059-A.

RICHARDSON SCALE COMPANY
Passaic, New Jersey

New York City Boston Buffalo Chicago Minneapolis Omaha
Wichita San Francisco Memphis Atlanta

(*Continued from Page 46*)

Theban Empire, did not know of the wax candle, and no genuine candle of any such material appears to have been invented at that time. This statement is made in spite of the fact that it is usual to speak of the seven pronged golden candle-stick of the Jews, which was used in the tabernacle.

This was actually a candelabra with seven arms, at the ends of which were seven lamps. A proof of this is the statement in the 37th chapter of Exodus: "And he made the lamps thereof, seven, and the snuffers thereof, and the snuff dishes thereof of pure gold." Again we read in Liviticus, Chapter 24, "Command the children of Israel, that they bring unto thee pure olive oil, beaten for the light, to cause a lamp to burn continually."

A representation of this candlestick, or rather candelabra, is carved on the arch of Titus, where it appears among the spoils taken by the emperor when he conquered Jerusalem.

Most of the lamps discovered in the ruins of Babylonia and Assyria were of baked clay. Some of them imitated animals which the formation of the bowl and spout suggested.

During great festivals efforts were made to light the main streets of the Eastern cities by standing on the corners huge vessels containing as much as a hundred pounds of fat, which were kept supplied and burning throughout the night.

A knowledge of petroleum, and even of natural gas had already spread over Asia Minor. This was due to the various springs of bitumen in that district, and in the case of gas, to the apparently mysterious phenomena of the Baku district. An Assyrian bas-relief of the 9th Century B. C. illustrates the defenders of a city throwing burning brands which had been soaked in oil on the heads of the besiegers.

The natural gas which issued from the ground in various places in the Baku oil fields was considered a corroboration of their religion and held sacred by the fire-worshippers. Indeed, the sacred and ever-burning fire of the temple of Baku was kept lighted until a very recent period.

Coal Buying and Burning for Industrial Power

(*Continued from Page 21*)

number of its heat units liberated through its combustion, per pound or other weight used for measure. Many engineers are quite content to report the quantity of water evaporated per pound of coal burned, this, however, being without practical value as a measure of efficiency. For example, the evaporation of eight pounds of water per pound of coal burned represents about 53% or 70% efficiency according to whether the pound of coal contains 14,000 or 11,000 BTU. It might be noted that United States coals analyzed by the Bureau of Mines show variations in BTU per pound from 6,300 and 8,400 in western lignites up to 15,000 for some of the West Virginia coals, the latter bearing more thermal units than pure carbon does.

Please do not ask the plant engineer to make coal analyses. That process is one of extreme delicacy and skill, involves the trained use of complicated and expensive instruments, and an accurate analysis of any particular fuel can be made by a central laboratory with better results and much more economically. Detailed instructions for obtaining samples for this purpose should be secured and carefully followed.

The actual cost of coal is *not its price per ton.* To the delivered price we must add unloading cost, all rehandling, transfer from storage to fire-bed, cost of extraction for useful work of its heat units, removal and disposal of ash, and the carrying charges on the investment in reserve supply, and space. One coal which de-

Digitized by Google

livers 60% efficiency through the power plant may, by reason of differences in costs, be more profitable to use than a higher priced coal which will deliver 70% efficiency.

Storage of Coal

Coal is frequent stored for reasons of supply or because of market conditions. Anthracite presents no difficulties, but the bituminous coals require much study and care. Such coals when being air-stored should be handled during the cooler hours or on cloudy days because the added heat from bright sunlight is too often sufficient to cause or expedite spontaneous combustion. After the pile is completed it will of course absorb heat during the day, but release it at night.

Some loss always occurs in stored coal because of the oxydizing of both organic and inorganic matter. Ten per cent of its heating value may be thus dissipated, and as a rule the greatest part of the loss takes place within the first two weeks of storage. Whether in covered or open storage seems to make no appreciable difference. Coals from different fields endure storage with varying losses, the western and lignites showing greater losses than eastern coals.

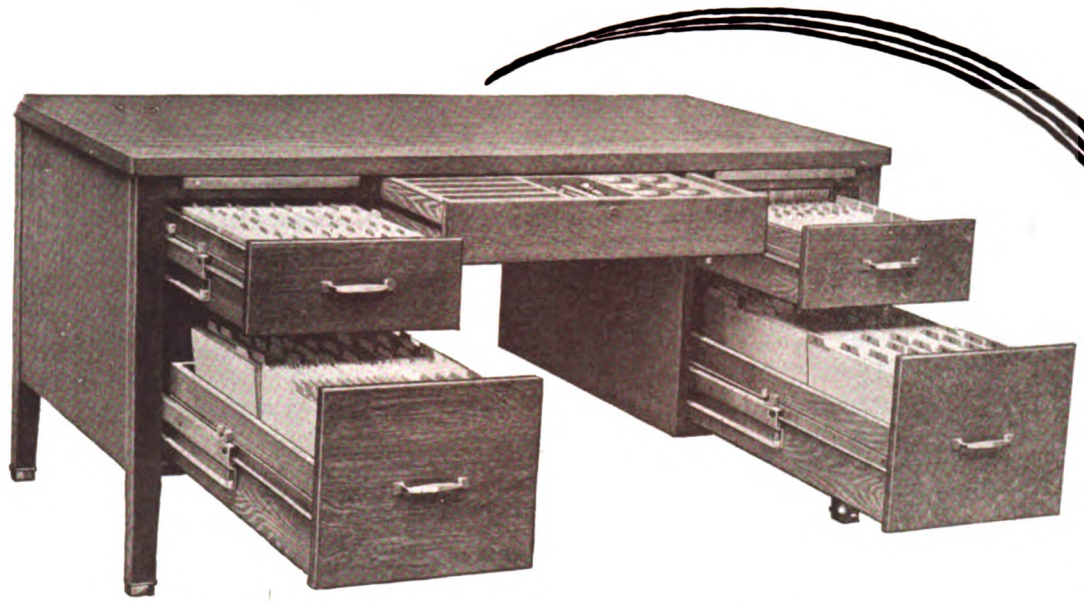
The great danger of course is from spontaneous combustion. If the coal presents large amounts of surface, as dust does, or in case dust and lumps are mixed so that the pile contains many air spaces, then such danger is increased. The cause of spontaneous combustion is oxydization in air sufficient for that process, yet not enough air being present to carry off the heat thus produced. The Bureau of Mines does not believe moisture present is a fact of importance in spontaneous combustion.

The ventilation of coal piles through pipes is always harmful. Generally speaking, it is wiser to store only coal of screened nut size. Never allow lumps to collect at the bottom, but keep the texture of the entire pile as uniform as possible, storing no coal within six weeks from the date it was mined. Pile so that no point will be more than about ten feet from an air-cooled surface. Storage of coal under water is common in some localities and has no objectionable features other than requiring wet coal to be fired.

Moisture in coal represents loss because it must be heated from room temperatures to flue gas temperatures, all at atmospheric pressure, and the heat thus used is stolen from the boiler. There are, however, some few coals in which moisture results in a mechanical action of loosening in the fuel bed owing to the steam generated, thus assisting combustion and possibly doing so to an extent sufficient to balance the heat losses, and the "wetting down" of such coal may be justified, but only when such results are *known* to be both necessary and certain. But to wet all coal as a habit or rule merely, is folly.

Combustion—Smoke and Ash

The sequence of events which take place in burning coal is in three general steps. 1. Moisture is driven off. This occurs quickly and is complete at rather low temperatures, up to



You can't lose things in a desk like this!

STUDY the convenient arrangement of the desk above, the deep vertical files in the bottom drawers, the spacious compartments in the uppers and center. A place for everything.

Contrast this with office desks where the very arrangement discourages good order. Note these striking advantages of

The "Y and E" Efficiency Desk

1 ***Individually arranged*** — Six different models, each with a wide variety of possible drawer combinations. A desk for every business. Let us arrange one purposely for *you*.

2 ***A complete filing system*** — The deep vertical files and roomy compartments make a filing system in themselves. Saves the expense and space of a separate cabinet.

3 ***Drawers that can't stick*** — Every busy man knows the annoyance of jammed and sticking desk drawers. The "Y and E" frictionless drawer slide (a patented feature) eliminates all that. A flip of the hand sends drawers rolling out or in.

Send for our free booklet, "The Executive's Workshop," which gives a wealth of helpful hints about office equipment.

YAWMAN AND ERBE MFG. CO.

Filing System Service, Equipment and Supplies

743 St. Paul Street ROCHESTER, N.Y.

Branches, Agents or Dealers in all principal cities

In Canada:

The Office Specialty Mfg. Co., Ltd., Newmarket, Ont.

"Y and E"

Digitized by Google



"Sticks Out Like a Sore Thumb"

The need for a reliable and accurate instrument in taking Time Studies.

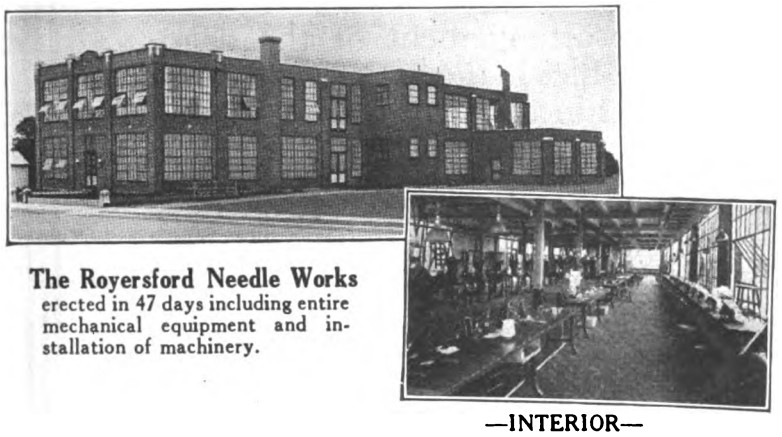
A watch recommended by a long-established, dependable house whose guarantees can be relied upon to the letter.
One that will reduce mental or pencil computation to the minimum and eliminate the keeping of cumbersome records.
The Time Study Watch computes automatically. After one operation has been performed it gives the result in figures of production per hour as well as the elapsed time in decimals of the minute.
It affords a handy, efficient and easy method of checking each operation and showing just where production costs can be reduced.
Eleven different Time Study Watches in our line, each with a function of its own.

Write for our folder. Sent free on request.

Stein & Ellbogen Co.

35 NORTH STATE STREET, CHICAGO
Established 1877

Stop Watches Time Study Watches
Precision Instruments



The Royersford Needle Works
erected in 47 days including entire mechanical equipment and installation of machinery.

—INTERIOR—

Save By Building Now!

UNDER the Beling-Bush Method of Standardized Construction we can erect your building in from 30 to 90 days. You save on plans and specifications. Constructions costs are now low and, with America entering into greater building activity, now is the time to build while costs remain low.

Let us help you on your next building. Write for information and catalog.

THE BELING-BUSH CO., INC.

FACTORY ENGINEERS AND BUILDERS
Drexel Building Pa.

THE SERVICE

212° F. 2. Volatiles (hydrogen, oxygen, sulphates, hydrocarbons) are distilled off by the increasing heat, but not all at the same temperature. This stage of combustion is progressive and if the temperature be high enough and oxygen present to allow it, these volatiles will burn and liberate their heat. If not, we have one principal cause of "smoke nuisance," which is also a money loss of heat units. 3. Fixed carbon has now begun to reach a stage where it ignites in the presence of admitted oxygen, and this process continues with the exposure of more carbon, elimination of the blanketing ash, and the continuation of flame. The highest temperatures are reached during this period. It also continues longest.

Smoke interests us if we are studying economy. Its presence shows that waste is going on, but it does not follow that denser smoke and greatest waste go together, nor that the emission of little or no smoke from the stacks is proof of no loss. Smoke is but one manifestation of waste. It is due to: 1. Lack of air, 2. Poor mixing of air and gases, 3. Low temperatures, 4. Too small combustion spaces, or to combinations of these factors. It is hardly safe to go further than to say the presence of smoke always indicates waste due to improper combustion, and that its presence should therefore be discouraged all possible, even though it cannot be eliminated wholly.

The residue after combustion is important as a problem in disposal. It constitutes ash, composed of all the non-combustible part of the original coal, plus what unburned portions the grate or firing methods allow to escape. Ash is a residue mixture of silicates, sulphates and oxides—the former largely predominating. When melted, it forms clinker or slag, but as all ash does not fuse at a fixed temperature we may assume in case of having much trouble with clinker that our particular ash has a low fusion point, probably under 2500° F.

A singular and not widely appreciated point regarding the fusion of ash should be noted. The same ash will become viscous and adhere at



THIS TRAMP IRON

has no terrors for "Pennsylvania" Coal Preparation Machinery, which has been specialized to pick out Tramp Iron automatically, or pass it without damage.

"Pennsylvania" Bradford Breakers, for large Central Stations, Mines and Gas Works, with almost human precision throw out tramp iron, rock, bone and sulphur balls without damage to the machine and without power, labor or supervision.

"Pennsylvania" KINGCOAL Hammer Crushers, for preparing stoker sizes, are equipped with Patented non-magnetic Tramp Iron Separators and require no attention aside from occasional dumping.

"Pennsylvania" Single Roll Coal Crushers are of massive construction, provided with double Tramp Iron protection. They are designed to be forgotten by the operator.

Our Engineers study the requirements in each case and suggest the size and type of apparatus specialized to insure a continuous supply of properly prepared coal at minimum cost per ton for Central Stations, Gas Works, By-Product Coke Plants, Industrial Power Plants, Gas Producer Plants and Coal Mines.

Put your coal preparation problems up to us.



PENNSYLVANIA CRUSHER COMPANY
Stephen Girard Building, PHILADELPHIA
NEW YORK PITTSBURGH SEATTLE

Digitized by Google

different temperatures, depending on whether its enveloping atmosphere is an "oxydizing" or a "reducing" one. An oxydizing atmosphere exists where oxygen is being withdrawn from the air to unite with the carbon, while in a reducing atmosphere we are actually withdrawing oxygen from the combustion products, changing our CO_2 gases back to CO.

Oxydizing conditions obtain in the lower portions of the fuel bed, while reducing stages occur in the upper layers. Ash in an oxydizing atmosphere has a higher melting point by differences of between 120-260° F. Possibly this will explain how a combustion engineer will cure a furnace of its troublesome tendency to "paste up" bridge walls and arches, merely by proper admission of more air above the fuel bed. He thus changes the incorrect and harmful reducing stage to that of more complete and desirable, as well as profitable, oxydizing, and saves the heat losses while stopping injury from slag.

Ash reduces efficiency with its increase in percentage present because of resisting the contact of air with the fuel, requiring greater draft, lowering the proportionate heating value of the coal because of ash-content per ton, and lastly on account of the additional time and cost required for ash disposal. Ordinary coals usually contain between four and twenty-five per cent ash.

In planning ash pits and disposal equipment provision should be made for about the following percentages of ash refuse in cases of the coals named:

High grade seaboard	10%
Pittsburgh	15%
Illinois and Indiana	20%
Iowa and Southwestern	40%

The manner of handling the fuel bed may be easily responsible for much trouble with large clinker because ash which drifts down on the grates will not fuse there, while if it be lifted into the higher temperatures in the burning area of the fuel above, it will melt, run down, cool and harden, then appearing as cakes which reduce the firing area and ability of the grate. Therefore, excessive working or slicing of the fuel bed usually magnifies trouble with clinkers instead of curing it, as intended. Improvement comes from a better disposal of the ash without such disturbance as will mix and flux it. Side motion or twisting of slice bar is a protection against much clinkering, as likewise rocking or shaking grates may be.

While bad firing methods may hasten and increase the slagging of ash, its primary cause is fusing because of the silicates of the ash combining with other ash content which will lower its fusing point, or the improper creation of reducing instead of oxydizing temperatures in the fuel bed, which result in melting tendencies as explained. Therefore an exact knowledge of the constitutents of whatever coal the plant uses is of great value. This analysis sometimes results in an advantageous change being made in the type of grates installed, in order that the cheapest or most easily obtained fuel may be best handled.

Admitting, however, that delivery costs and matters of supply usually govern what fuel is available in average cases, rather than ideals or theories, then furnace equipment should be installed which is best suited to that supply. In any case, economy noticeably follows the correct relation between furnace equipment and the fuel used.

A few general rules may be applied. For example, if the coal to be used is rich in volatiles then a large combustion chamber and long flame travel must be arranged. The "Dutch oven" type of firebox has advantages in burning such coals, but care must be taken to set the overhead tiles far enough back so their reflecting heat shall not produce distillation of the freshly supplied fuel too rapidly. Overlooking this rule, particularly in hand-fired furnaces, make many a smoky stack.

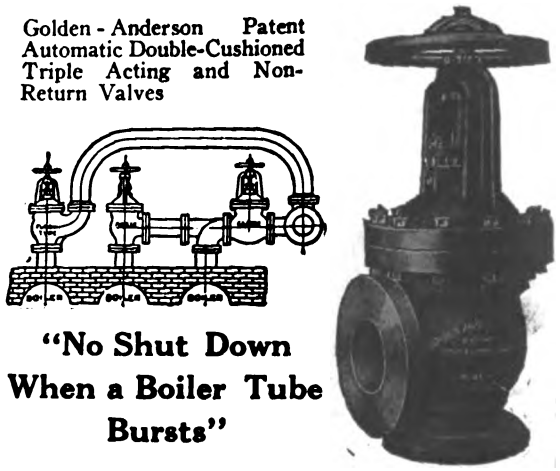
Arches and mixing pillars assist materially in properly handling richly volatile fuels. Large combustion spaces are of vital importance, and if so built as to cause changes in direction of gas travel, more intimate mixing is accomplished and this affords a more effective and efficient method

GOLDEN-ANDERSON Pat.

"Life and Property Insurance Valves"



Golden - Anderson Patent Automatic Double-Cushioned Triple Acting and Non-Return Valves



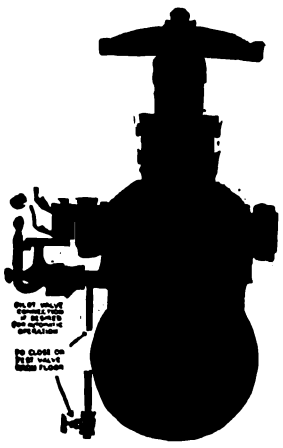
"No Shut Down When a Boiler Tube Bursts"

Triple Acting Style Globe Pattern

Plain Non-Return Style Angle Pattern

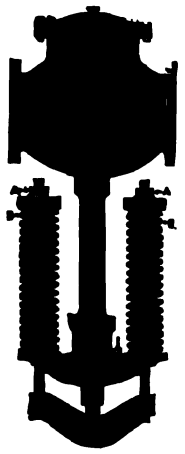
1—Prevent complete shutdowns in case of accident in any one of the boilers by isolating it from the line.
2—The triple acting style also shuts off the steam flow from all boilers when a steam pipe ruptures.
3—Automatically equalize the pressure, and prevent backflow of steam into a cold boiler.
4—Double-Cushioned in opening and closing by Corliss Dashpot. No pounding, chattering or sticking.
5—The only valves that can be tested in service from the boiler room floor.
6—Can be closed by steam or electricity from distant points.

4100 Used by the Large Iron and Steel Companies



Golden-Anderson Pat. Cushioned Combined Throttle and Automatic Engine Stop Valves
Give perfect automatic control of the steam or air flow in any pipe line from one or more distant points.
Can be opened or closed instantly in case of emergency by steam or electricity.
May be tested while in service, giving complete assurance of safety.
Positively cushioned by double Corliss Dash Pot. No banging, sticking or chattering.
Contain no springs or tight-fitting parts.
Can be adapted for automatic closure in case steam pipe bursts.
Double extra heavy and virtually indestructible.

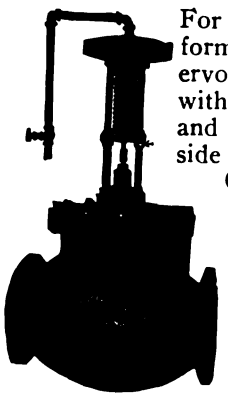
Golden-Anderson
Pat Automatic Cushioned Steam Pressure Reducing Valves



Automatically hold the reduced steam pressure constant.

Fitted with patent safety piston that prevents high pressure escaping to low pressure side.

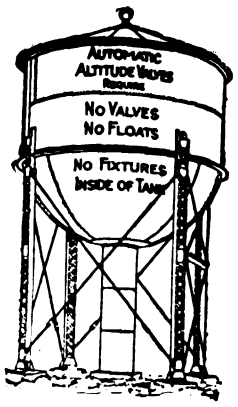
Golden-Anderson **Automatic Cushioned Controlling Altitude Valves**

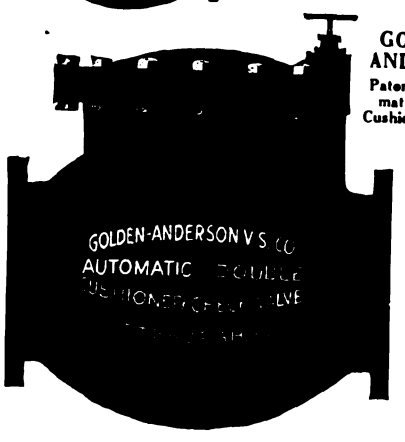


For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. Three Ways of Closing "These Valves."

1st—Automatically by Water.
2nd—By Electricity, if desired.
3rd—By Hand.

May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.





GOLDEN-ANDERSON
Patented Automatic Double Cushioned Check Valve

Golden-Anderson Pat. Automatic Cushioned Water Pressure Reducing Valves



Designed for high or low pressure reduction. Will maintain constant pressure. No shock, water hammer or surging.

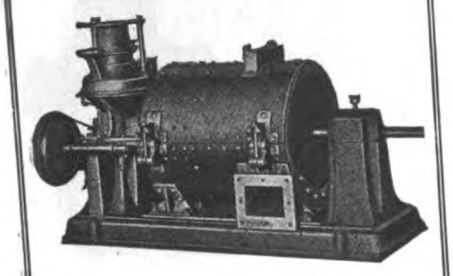
Can be operated electrically from distant points.

Sizes to 30 in.

Golden-Anderson Valve Specialty Co.
1306 Fulton Building **Pittsburgh, Pa.**

Digitized by Google

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway
New York

than pillars and arches alone do.

Steam publishes the following general classification of coals by percentages of carbon and volatile content:

	% fixed carbon	% volatiles
Eastern bituminous—	60-75	25-40
Western bituminous—	50-65	35-50

As a rule, high volatile coals do not give as good results as those bearing larger proportions of fixed carbon. Little difficulty is met in burning coals of low volatile content, therefore less skill and attention are needed, simpler apparatus may be installed and yet as good or better results obtained, on the average.

Broadly descriptive, it may be said the central-west bituminous coals are of a free burning type with high ash content. It is rather well settled that such coals are handled to advantage with chain grates, which are not, however, well suited to coals inclined to coke and carrying low percentages of ash-characteristics of coals from eastern fields.

The size and style of grate surfaces must be selected with reference to the fuel used. Plain bars are adapted to large size lumps, and the herringbone or drilled types serve best with fine coal. If the coal has a high ash content, much saving can be made through the use of shaking or dumping grates. Chain grates as used in many stoker equipments are not commonly well suited to coals of small ash content, but will handle well a free-burning coal of high ash proportions.

It may be noted that if the coal to be used is lignite, subbituminous, semi-anthracite or fine-sized anthracite, then natural draft must often be replaced by mechanical or forced draft because the height of stack called for to maintain the necessary natural draft will be found prohibitive. All large sized coals may be burned with lower draft pressure.

Also if the steam plant supplies a dye works, distillery, laundry, or other industry which similarly requires very wide fluctuations in the amounts of steam called for, and the times of delivery of such amounts, it will be found well worth the trouble and extra expense, if any, to provide a coal for fuel whose ash has a high fusion point.

Hand-fired Boilers

If our boilers are hand fired, let us completely destroy (not merely lay aside) the ash pit doors before another day passes. There is ordinarily no more costly proceeding on the fireman's part than the closing of these doors, with the consequent stopping all entry of air below the grates.

Whenever checking of the rate of combustion is demanded it should be made possible only by closing the stack or breeching damper. If gases are prevented from escaping at the outlet, air cannot enter, and this is the only correct theory of checking. Closing of ash pit doors invariably heats the grates and weakens them, forms slag or clinker with the stoppage of air, causing repair and replacement expense which is wholly needless.

Another bad result is that increased pressure is thrown on every air duct or leak into the boiler setting when ash pit doors are closed, resulting in the increase of cold excess air with its damage to boiler shell and loss of heat through lowering of temperatures.

In hand fired boilers the Bureau of Mines has tested out the two methods of firing commonly used. One is the spreading method wherein small amounts of coal are cast on the fire either in "strips" or over the entire grate area. The conclusion stated is that this method gives higher CO_2, lower temperatures in gases leaving the boiler, greater uniformity in furnace temperatures, and better over-all furnace efficiency.

The other or coking method requires fresh coal in larger amounts to be fired near the doors, and when coked, to be pushed further back, progressively. Where the furnace design is such as to pass the gases horizontally to the rear over the fire bed and thus permit the flaming area to force combustion of the volatiles from the coking coal, then this system of firing is applicable—otherwise not. The coking method can be used only with a rather steady steam demand and does not lend itself well to handling of a fluctuating load. Ordinarily this method is productive of less smoke, but be-

JUST SUPPOSE—

You had coming to you every month—

A Big Bunch of Pictured Progress

Such as you see in this copy of

Industry Illustrated

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and sparkle into the daily grind you have always wanted—but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This coupon is for *You*—use it *Now!*

Engineering Magazine Co.
120 West 32nd Street, New York

Send me *Industry Illustrated* every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name.....

.....

Mailing Address.....

.....

Company.....

Position.....
(Important information—for our own records)

ANNUAL SUBSCRIPTION $1.00
In Canada, $1.25 Foreign, $1.50
(AD-JULY)

Digitized by Google

cause of the necessary exposure of large areas of the grate while moving the fuel bed sectionally to the rear, as described, large losses are bound to occur from excess air entering.

Any hand firing is hard physical labor, yet requires skill and care. The man who is clever enough to give this subject the proper study usually promotes himself out of the fireman's job. Right here the engineer should provide for a record of flue gas analysis from which he can identify the unguarded and unguessed wastes always present, and improve firing conditions and methods by knowing exactly what is needed.

In any event, light and frequent firing should be done. This insures the fuel supplied bearing a better relation to the usually constant air supply we find in hand-fired plants, likewise tending to prevent thin spots occurring in the fire and burning through, to admit excess air.

Ideal conditions call for the admission of larger quantities of air over the fire immediately after throwing on fresh coal, so the prompt combustion of the distilled volatiles may be correctly accomplished. Then this excess air supply should be cut down by steps. It is readily seen how impossible is the giving of such care on the part of the average fireman. this fault being nevertheless a very substantial factor in the constant waste of fuel. The method of lighter and more frequent firing is therefore seen to be the more practical and efficient, in a general sense, and considering conditions broadly as we are apt to find them in the average furnace room.

Stoker Firing

As to stokers, there are three general types, the chain or traveling grate, underfeed types and overfeed types. All provide for the coking or progressive method of firing, subjecting the coal to distillation at a constantly increasing rate until it reaches the fire zone and is there consumed.

Stokers of most types are and can be operated with natural draft. However, those stokers intended for burning fine sizes of coals are necessarily equipped with forced draft devices, feeding air under whatever pressure may be needed. Forced draft is often arranged for in order to drive boilers at an over-rating.

All styles are power driven. The fuel is fed from hopper supply at rates which can be governed. The speed of travel of the fuel bed can be regulated. Thus it is possible to feed fuel at whatever rate will insure its complete burning by the time the discharge point has been reached, without carrying unburned portions over into the ash pit. Likewise the rate of combustion and amount of coal burned can be adjusted in accord with the demand for steam, more closely than with hand firing. The operator need attend but one or two adjustments without extra labor, to vary his steam output.

Stokers allow larger amounts of fuel to be handled at lower costs, permit boiler capacities to be attained or exceeded with greater ease and the certainty of uniform results, and, when used, the engineer is able to establish a closer system of economical combustion, as a rule.

The stoker alone does not solve the problems of best efficiency and economy. Any method of firing steam boilers to the best advantage requires understanding of the subject of combustion, care and study in application, proper instruments for study of boiler and furnace conditions, all so that *facts* can be known and not guessed at. Some of the practical angles of this subject of correct operation, when presented, will help the plant executive to a working understanding of what can be and is being done in this department toward an appreciable saving in fuel and operating costs.

It is far from being a difficult subject. It is merely not widely and thoroughly understood as yet.

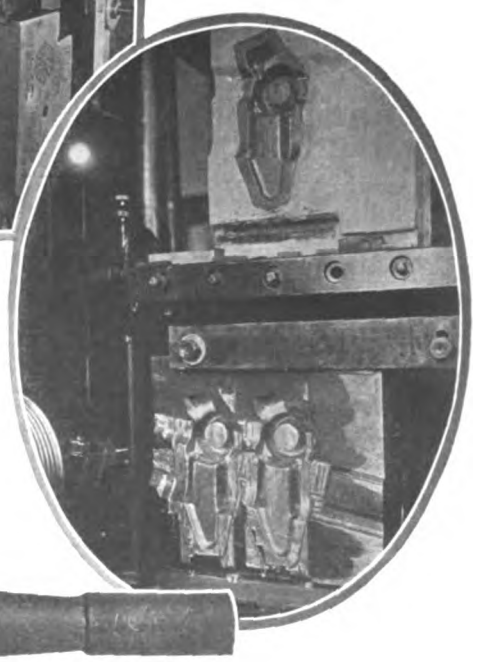
Do It Mechanically —by the Keller Method

A few illustrations showing how the *drop forger* is doing it. Modern efficiency makes hand methods obsolete.

KME



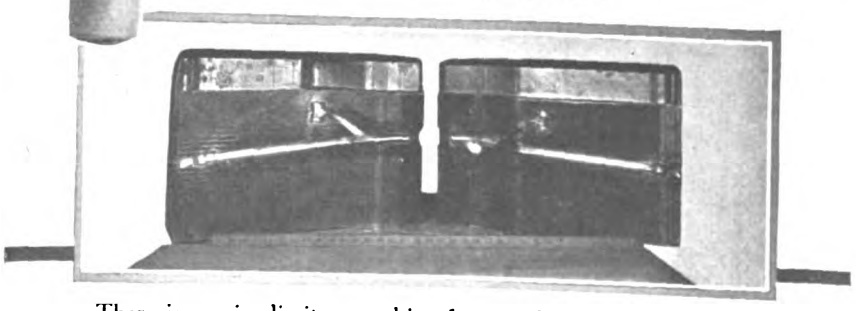
A large wrench manufacturer is cutting dies like these on a Keller Automatic Machine in eight hours.



Intricate locks and deep cutting present no difficulty to a Keller Machine. Note how it has reproduced in steel two impressions with locks and all, from a plaster pattern—working *automatically.*



Ford Steering Knuckle—the dies are cut automatically in 13 hours.



There is no size limit—anything from a clevis to a crankshaft.

The Keller method is applicable to every industry using Dies, Molds, Core Boxes and Patterns.

ASK HOW IT APPLIES TO YOU

KELLER MECHANICAL ENGRAVING CO., 58 Washington St., Brooklyn, N. Y.

Digitized by Google

HUNT CONVEYOR

Conveys Coal, Ashes, Phosphate Rock, Cement Clinker and other similar bulk material with little attention, handling large tonnage at a very low maintenance and operating cost.

A RUGGED, RELIABLE MACHINE—GOOD FOR YEARS OF HARD SERVICE.

Catalogue G-20-2 fully describes the machine and contains detailed information helpful in adapting it to new or old Power Plants, Cement Mills, Coaling Stations, etc. Copy gladly sent to those interested.

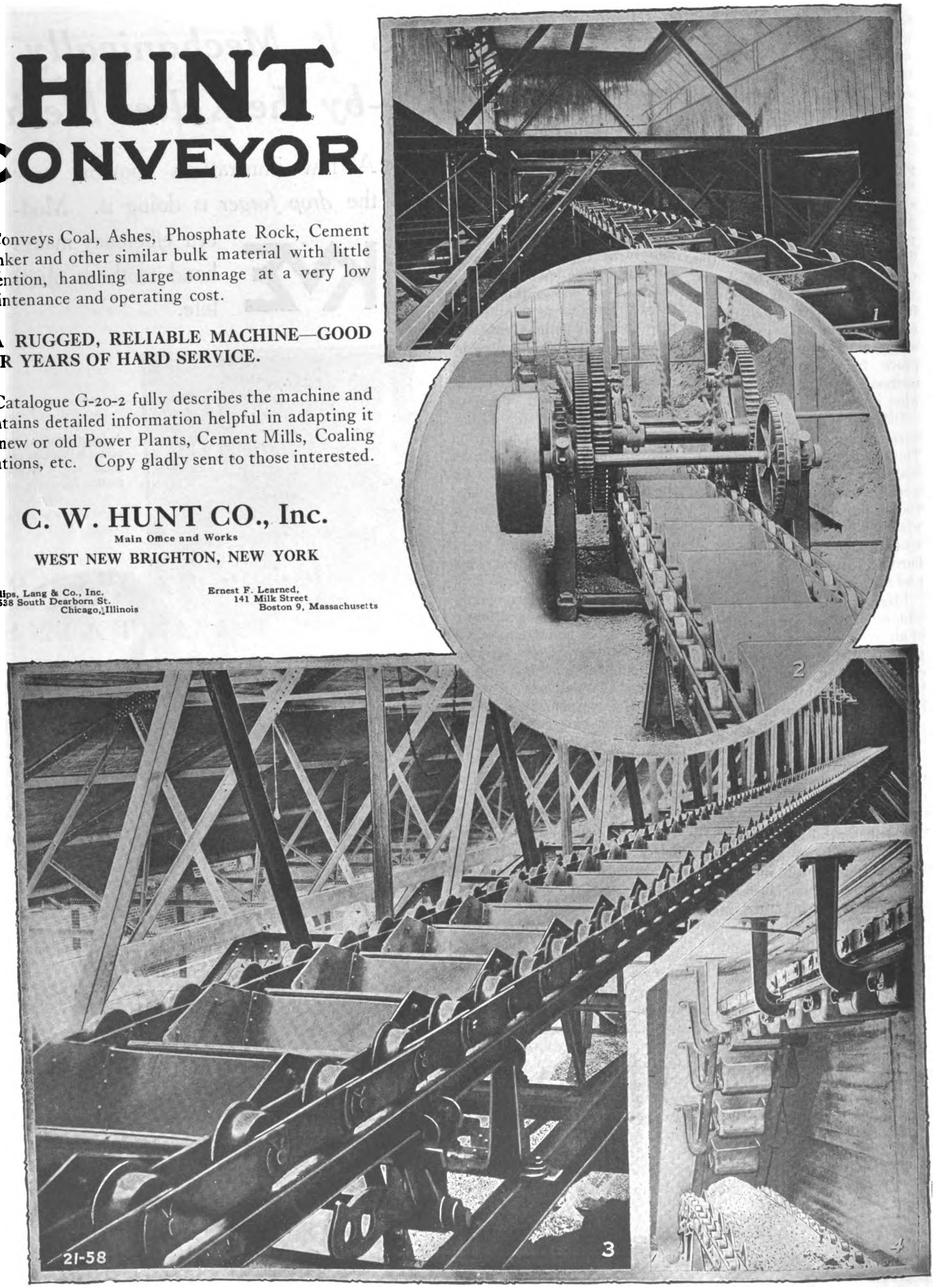
C. W. HUNT CO., Inc.

Main Office and Works

WEST NEW BRIGHTON, NEW YORK

Phillips, Lang & Co., Inc.
538 South Dearborn St.
Chicago, Illinois

Ernest F. Learned,
141 Milk Street
Boston 9, Massachusetts



1. Pivoted bucket conveyor with cast iron buckets.
2. Hunt Pawl Driver which insures an "even" pull on conveyor chain at all times.
3. Conveyor with sheet steel buckets for handling coal, installed in large Pumping Station.
4. Upper and lower run of conveyor with sheet steel buckets showing one of the many methods of supporting conveyor.

Digitized by Google

The Future of Electrical Engineering

(*Continued from Page 23*)

water. A water power operating by itself is obviously limited in its capacity to the smallest stream flow of the year. By inter-connecting a number of water powers this disadvantage becomes much less since the periods of low water will not in general coincide. Further temporary reserve power will be afforded by steam stations connected to the same system. Where it is practicable to do so the steam generating stations feeding into such a system will unquestionably be located at the mine mouths, thus avoiding the transporting of coal over long distances and relieving to a large extent the load upon our railroads. It is unfortunately impracticable in many cases to do this since frequently a sufficient supply of water for condensing the steam is not available. The development above indicated is going on day by day and is only a question of time until the greater portion of our power will be generated and transmitted in this way.

Railway Electrification

One of the great needs of today is the further electrification of railroads. The steam locomotive, as we know it today, is a magnificant piece of work, but it apparently has reached nearly the limit of its development, both in power and in economy. A pound of coal burned in a first class modern plant will do from three to five times as much work as a pound of coal burned in the best locomotive. If we are to conserve our coal resources, obviously one of the first places to start is with the steam locomotive.

In addition to the fact that it uses much less coal, the electric locomotive has many other advantages which cannot be treated at length here. For one thing it can be made much more powerful than the steam locomotive so that it is entirely practicable to double the speed of freight trains over mountain divisions of our railroads by substituting electric for steam locomotives. Electrification will greatly increase the capacity of our railroads and will of course tend to relieve freight congestion. The great thing standing in the way of the electrification of the railroads today is the lack of available money to make the change. No one doubts that the saving would easily pay for the cost of the change in many cases, but if the railroads have not the ready cash they are helpless. This is a condition which we hope to see improved in the near future.

The creation of the super power system mentioned above will obviously assist greatly in electrification of the railroads. If the railroad is paralleled by a transmission line it will obviously be much easier in most cases for it to purchase its power than to build power plants and transmission lines of its own. Not only will the initial investment be much less, but probably the power can be supplied at a lower rate than the railroad could generate it for itself.

Electrical Heating

It will unquestionably occur to many people that with a power system as above outlined, electric heating of homes would become practicable. This, however, is one of the things which is apparently hopeless. Even our best power stations waste far more of the heat of the coal than they are able to use. It is obviously impossible to generate power, wasting in the process three-fourths of the heat value of the coal, transmit it over long distances at a heavy expense for conductors and waste still more on the way and then use the power for heating in such a way as to compete with coal. With any possible price for electricity that we can see now, it would take most of a man's income to pay the bills for heating his home. In isolated cases where power is very cheap and coal is very dear and the user is willing to pay something for the convenience, electric heating of homes may be used.

I can, however, foresee very

Stop the Time Waste on Drinks



How much time do your men spend each day going for drink? If they must seek a distant hydrant, five minutes is a conservative estimate. That amounts to twenty-five hours annually. Multiply this by the number of men in your employ—doesn't the tremendous time loss convince you that convenient drinking equipment will save money in your plant? R&S fountains can be placed anywhere — there's a style that fits conditions in your factory. And they are thoroughly sanitary. *Lips cannot touch the mouthpiece*—contaminating germs cannot fall back into the jet. Scores of big and little concerns are saving hundreds of dollars annually with these fountains. Write today for complete catalog and free information.

Rundle-Spence Mfg. Co.
Milwaukee Wisconsin
R & S FOUNTAINS

What Would *You* Rate in the Edison Test?

What difference does it make? No one knows everything—no one needs to.

The essential thing is to know where to get the knowledge you want when you need it.

We are the source of the scientific and technical information you need. Let us tell you, and keep you informed.

What are YOUR needs?

SCHAAF RESEARCH SERVICE
15 East 40th Street New York, N. Y.

Digitized by Google

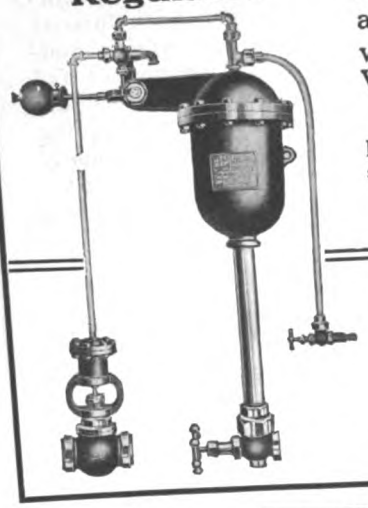
Boiler Room Economy —a fact

NO boiler room can be run efficiently if the regulation of the feed water is left entirely to the human element.

The water level should be kept constantly at the proper point in order to be assured that coal is not wasted unnecessarily.

The VIGILANT Feed Water Regulator, the premier regulator in the field, has been giving steady reliable service for over 25 years. It holds the water level to a given point. There are no complicated parts to adjust or get out of order. It cannot fail to operate because it depends on gravity for its action. It is an absolute safeguard against explosions because low water is impossible with the VIGILANT.

VIGILANT Feed Water Regulator



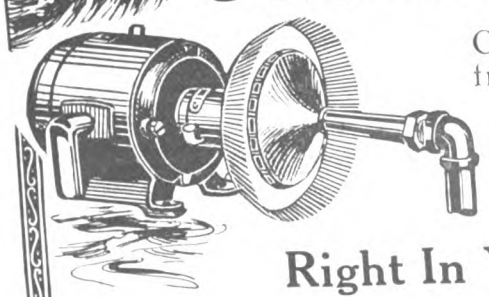
Our catalogue describing the Vigilant Feed Water Regulator and our other steam specialties should be in your files.

Send for it.

The Chaplin Fulton Mfg. Co.
28-36 Penn Ave.
Pittsburgh Penna.



The Equivalent of Sea Breezes



Clean, invigorating, dust free air, containing the proper proportion of moisture is essential to bodily comfort. You can have the equivalent of sea breezes

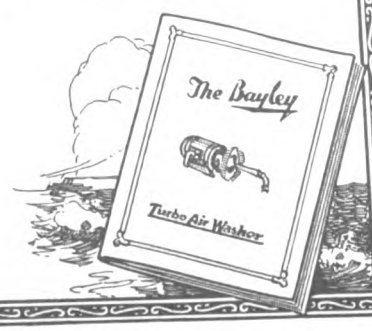
Right In Your Building

with rate of flow, temperature and humidity under perfect control if you equip your building with a

TURBO AIR WASHER AND CONDITIONER

This wonderfully efficient unit supplies a constant volume of pure air, regardless of atmospheric conditions, and keeps the room temperature practically uniform whether outside temperatures are 40 below zero, or 100 in the shade.

Send for free book on air washing and conditioning today.



Bayley Mfg. Co., Dept. P.
Milwaukee, Wis.

clearly an increasing use of electric heating in the various industries, for example, in the production of fine steels, in heating electric ovens and other places where localized clean heat is necessary. In fact this phase of the utilization of electricity has already assumed tremendous importance. Electric cooking falls in this catagory and there is little doubt but that it will be extensively used in the future. The cost will probably always be a little greater than the cost of cooking by gas, but convenience and cleanliness will in many cases compensate for this small additional cost.

The electrified ship, as far as battle ships are concerned, has already become the standard and there is considerable reason to believe that electric propulsion will be used extensively for other large ships. It is, of course necessary to generate the power by means of an electric generator driven by a steam turbine and conduct it by means of cables to the motor which drives the propeller. There are certain technical advantages in doing this rather than driving the propeller direct by the steam turbine but a full discussion of this would be out of place here.

All the above extensions of the use of electricity are in my opinion clearly in sight. In addition electrical engineers have their dreams which they would like to see come true and some of which may some day be realized. One dream is the light storage battery. It is unfortunate that in order to store energy in a storage battery the battery must weigh upwards of three hundred times as much as would a quantity of gasoline containing the same amount of energy. The battery of an electric automobile for example weighs perhaps one thousand pounds and is capable of propelling the vehicle one hundred miles at a low rate of speed. The gasoline necessary to give the same mileage with the same weight of car would weigh only a few pounds. Were some inventor to produce a battery capable of storing somewhere near the same energy per pound of weight as we can now store in coal or gasoline, there is no question but that the gasoline automobile would disappear almost over night and we could substitute for it the comparatively simple, cheap and noiseless electric automobile. It is hardly necessary to add that no such battery is in sight, but it is a pleasant dream that we may indulge ourselves in when we have nothing better to do.

The direct production of electric power from coal without the interposition of a boiler, steam engine and electric generator is another favorite dream. If this can ever be carried out it will work an industrial revolution greater perhaps than any we have ever seen. Numerous attempts have been made along this line, but the indications of complete success are very faint.

The wireless transmission of power is a favorite theme with our newspapers. Apparently there is no inherent reason why this could not be carried out provided it were done on a large enough scale; namely by one unified system supplying the entire world with power. No method has ever been worked out of directing wireless waves with any great degree of accuracy. Anyone who wishes can erect an aerial and tap into any of the waves that happen to be going by. This is one of the obstacles in the way of the wireless telephone as a universal means of communication since so far no means has been found of directing the waves enough to make communications secret. Besides this difficulty there is not, at present, in sight any kind of a motor which could be operated by the current derived from electric waves used in wireless transmission. This is a dream whose realization as I see it is far in the future if indeed it ever comes to pass.

Digitized by Google



"It's a Mathews."

Saves Forty Dollars per Day

THE PIONEER PAPER CO., Los Angeles, is doing this with a Mathews Gravity Conveying System.

Rolls of Roofing Paper are delivered by gravity from one building to another, over a bridge with a clear span of ninety feet as fast as ten men can handle them at the finishing bench. The work was formerly done with industrial track and truck system.

What Is Your Conveying Problem?

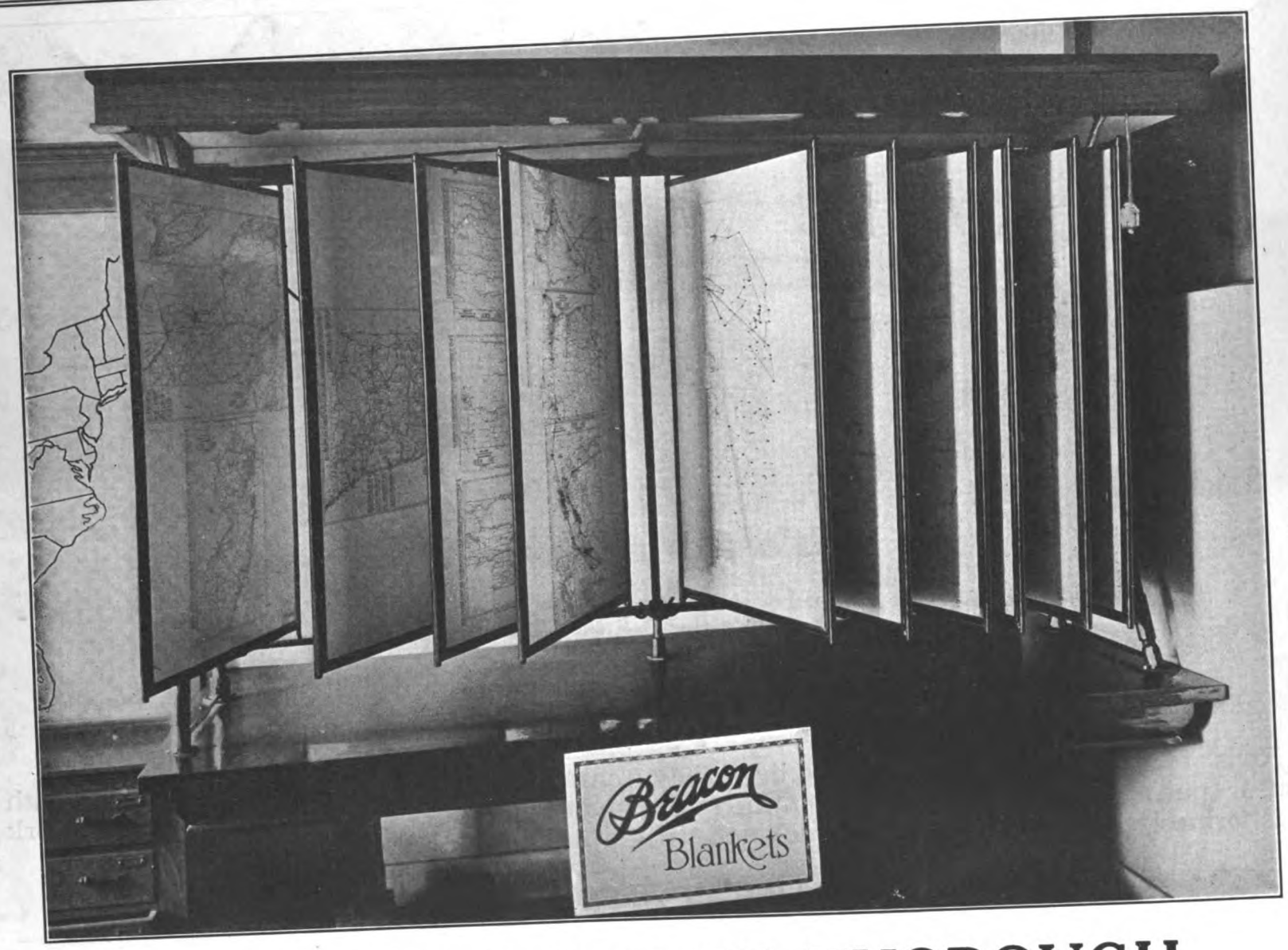
Let a Mathews Engineer Solve it for you. The service is free.
Send for a General Catalog.

MATHEWS GRAVITY CARRIER COMPANY
157 Tenth St., ELLWOOD CITY, PA.

Branch Factories:
Port Hope, Ontario, London, England



Digitized by Google



YOU TOO MUST BE THOROUGH IN YOUR SALES METHODS

Proper market analysis and sales effort just now means the difference between full capacity production and "No Business." A swinging leaf fixture with maps, covering the entire United States, or just the states you need, will help you picture conditions so you can successfully judge your sales policies.

Some Things This Outfit Can Do For You

1. Show routes to take to cover gaps in sales effort.
2. Show you to which agent or territory inquiry should be referred.
3. Save hundreds and perhaps thousands of dollars by economically routing your salesmen.
4. Show results of advertising campaigns graphically, disclosing holes or gaps in territory which are not covered by mediums you are using.
5. Show your Directors what your campaigns are accomplishing and where effort is needed.

COUPON

Educational Exhibition Co., 127 Custom House St., Providence, R. I.

Gentlemen:—

Send me, without obligation, details of EDEXCO Swinging Leaf Fixture Map Equipment. I am especially interested in (check if you desire)

☐ Fixtures ☐ Map Mount ☐ Map Pins

Name..... *Title*.....

Firm.....

St. and No......

City and State.....

I also inclose ONE DOLLAR for Trial Assortment of Map Pins and Small Cork (EDEXCO) Mounted U. S. Map.

Edexco Standard Equipment is Different

A Map System is not just a Map System—It must be Dependable and Durable.

Edexco Specifications

LEAVES—EDEXCO Cork Mount made exclusively by us. Pins are held securely but are easily inserted and removed. Repeated insertions in same spot do not affect this EDEXCO Mount.

MAPS—EDEXCO Outline Maps, plain white with black printing, show up pin colors best but we can supply maps of any maker on our fixtures.

FIXTURES—5/8" Steel Tubing Leaves, strong construction fixture in several styles.

FINISH—Transparent, washable lacquer over surface of all maps so you can write on them in ink or pencil.

MAP PINS—EDEXCO Solid Color Glass Head Pins, made exclusively in our own factory. The value of permanence in colors cannot be overestimated.

In EDEXCO Pins the color is fused in the glass. It cannot fade and will not chip off. We have the largest assortment of shapes, sizes and colors available anywhere.

SERVICE—We intend to sell you only the outfit best for your purpose. You will find us glad to work carefully with you to attain that end.

EDUCATIONAL EXHIBITION CO., 127 Custom House Street, PROVIDENCE, R. I.

Digitized by Google



Conveyors Will Fit Your Plant Too

Manufacturers sometimes say to us, "We would install conveyors if we were building a new plant, but they wouldn't be practical here." The Franklin Motor Car Co. believed in conveyors and had the vision to see how they could be applied to their existing conditions just as effectively as if they were to build a new plant around their conveyorized production system.

Lamson engineers designed and built a conveyor system, which is highly successful. Although the workmen were changed from a piece-work to a day-work basis, the production was increased to such a point that the daily quota of cars was turned out with about 20% less employees.

"Success" in a production and conveying system means increased production, fewer men, by increasing the output per man; and a definite, mechanically controlled and regulated output. There are incidental, but wholly important advantages, such as saving in costly floor space by utilizing waste space, and the greater satisfaction of men who work with the conveying system.

What is your business?

A Lamson production and conveying system can be applied in almost any factory where goods are made. No matter what the weight, the bulk, the shape, the fragility—a Lamson System can be devised to do the work.

We are willing to accept the burden of proof. All you have to do is write and tell us you want our representative to make a free survey of your plant. And there is no reason why you should postpone *knowing* what can be done for you. Write to us now.

Tel-U-Where
Information Bureaus will direct you to our agents and supply booklet

LAMSON SERVICE

THE LAMSON COMPANY
100 BOYLSTON ST., BOSTON, MASS.
Branches Everywhere

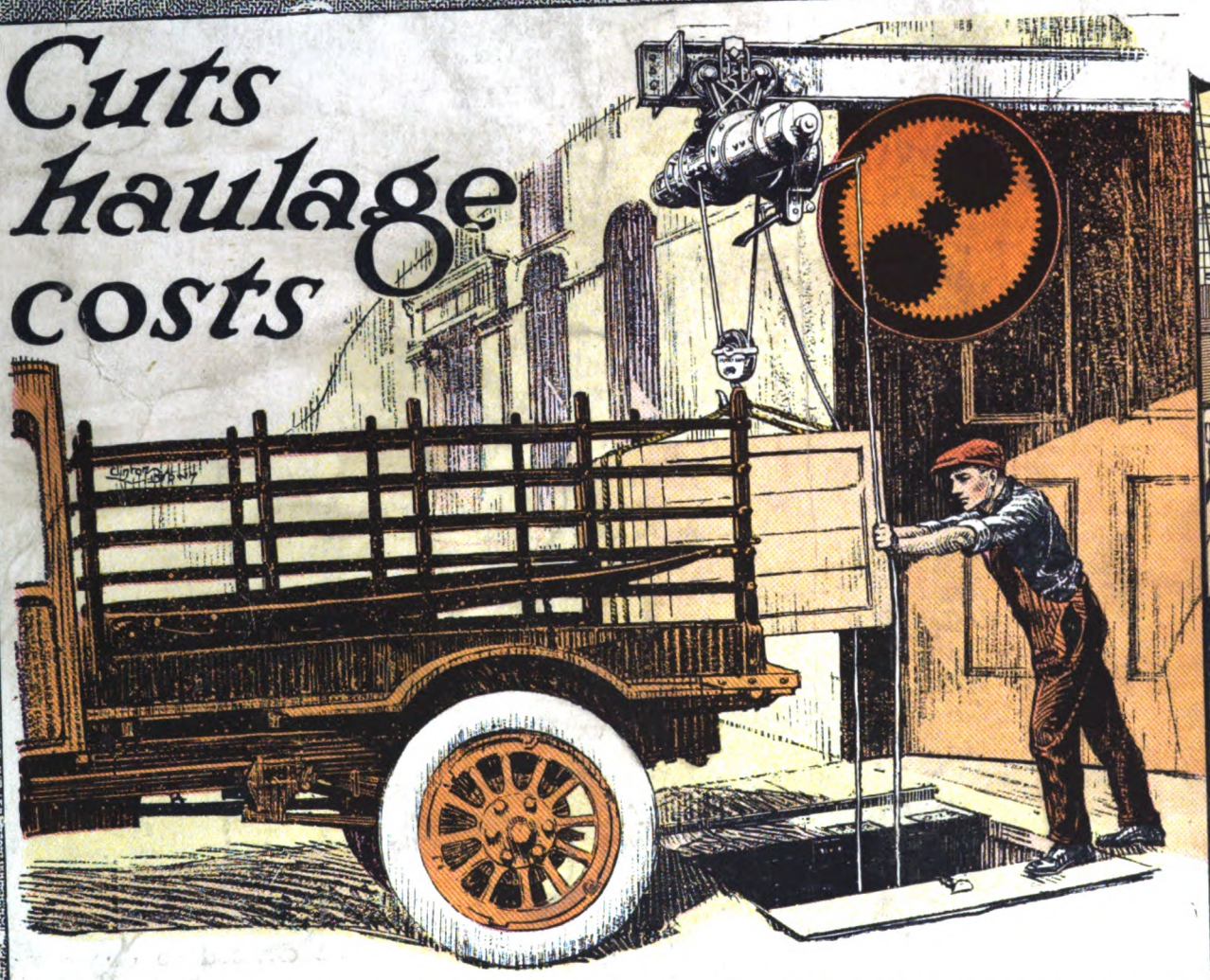
Lamson Conveying Systems

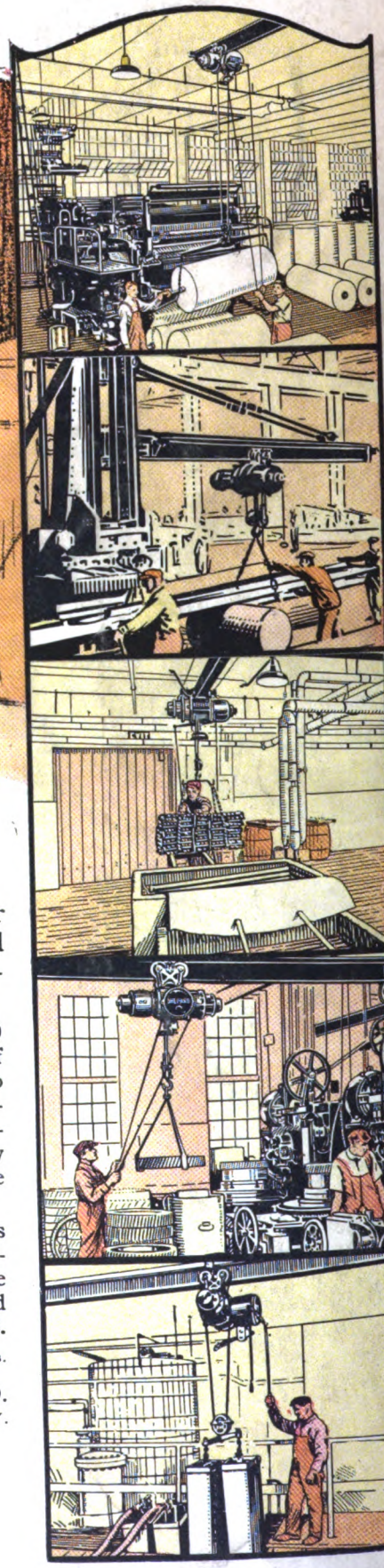
Digitized by Google

THE SHEPARD ELECTRIC LIFT ABOUT

A new and smaller Electric Hoist

Cuts haulage costs





AMONG the hundreds of lifting and load-moving jobs that ***LiftAbouts*** are doing, these powerful new small hoists have lowered trucking and haulage costs.

How? By carrying boxes, bales, barrels, crates, and other articles to or from motor trucks or wagons in less time and with less labor. The big saving is effected by cutting down the waiting time of each vehicle, with the result that more trips a day can be made over each route. The driver very often loads and unloads his own truck.

A LiftAbout operating on overhead track to shipping department will pick its load from any point within and carry it to shipping room or truck; or in receiving, will take its load from the truck and deliver it direct to the department inside to which it should go. On track extending over the sidewalk, a ***LiftAbout*** will raise or lower loads through a sidewalk hatch (when used in this manner, it provides very economical elevator service).

The ***LiftAbout*** is made in capacities to 2,000 pounds, and with it one man can handle loads of practically every type and proportion. Due to standardized manufacture and quantity production, this product of America's largest manufactuer of electric hoists is surprisingly low in price. It has the same features that have made "Shepards" famous the country over.

Right now the ***LiftAbout*** is giving hundreds of widely varying businesses the low cost load-moving that has long been sought. It may be your hoist, too. Investigate its advantages and economies. **WHAT DO YOU HANDLE?—TELL US.**

Shepard builds Electric Hoists and Cranes in capacities to 30 tons.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 SCHUYLER AVENUE, MONTOUR FALLS, N. Y.
Branches in principal cities.
Member Electric Hoist Manufacturers' Assn.

SHEPARD
ELECTRIC CRANES & HOISTS

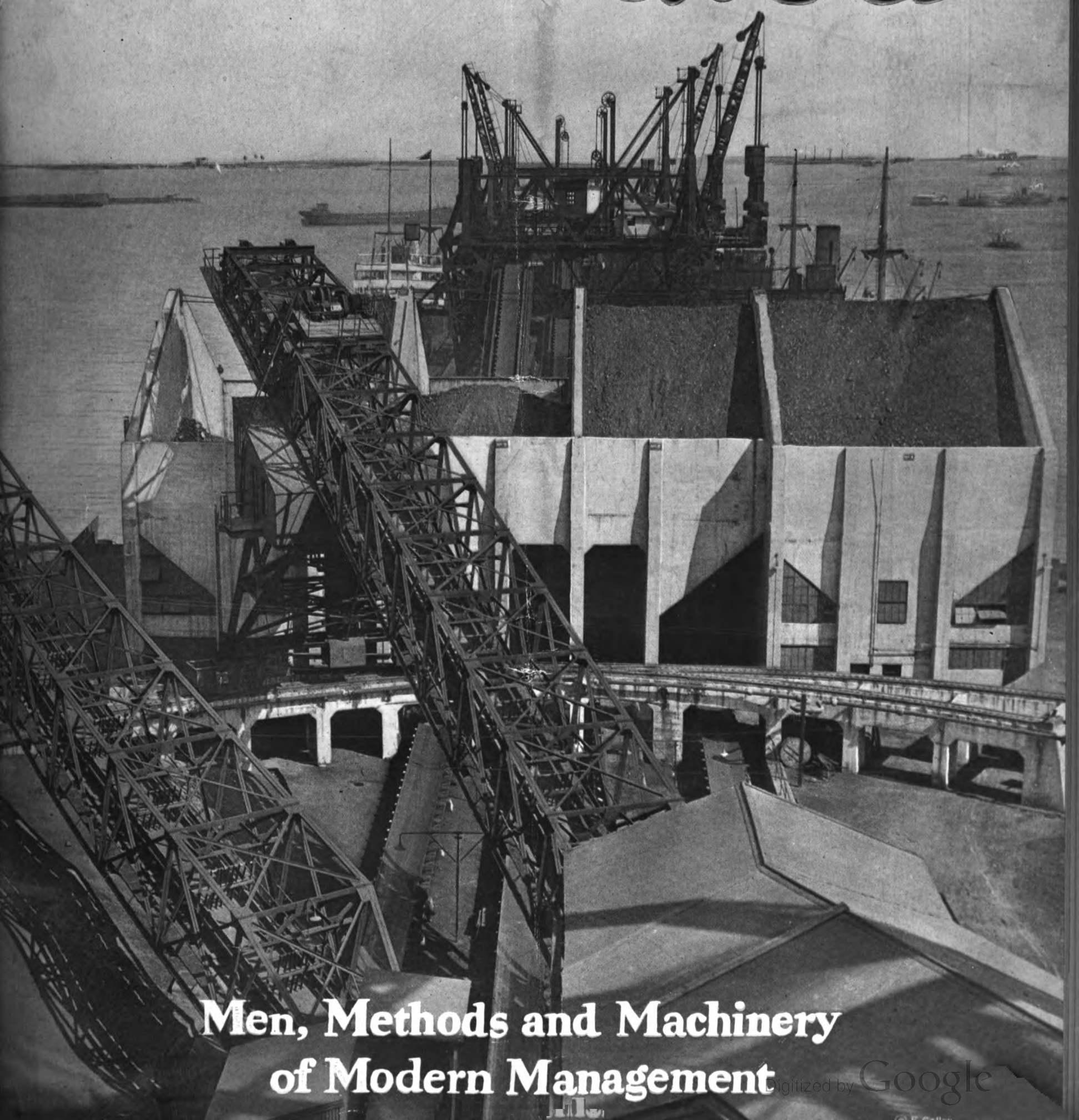
AUGUST 1922

C. & A. R. R.

10¢ per copy

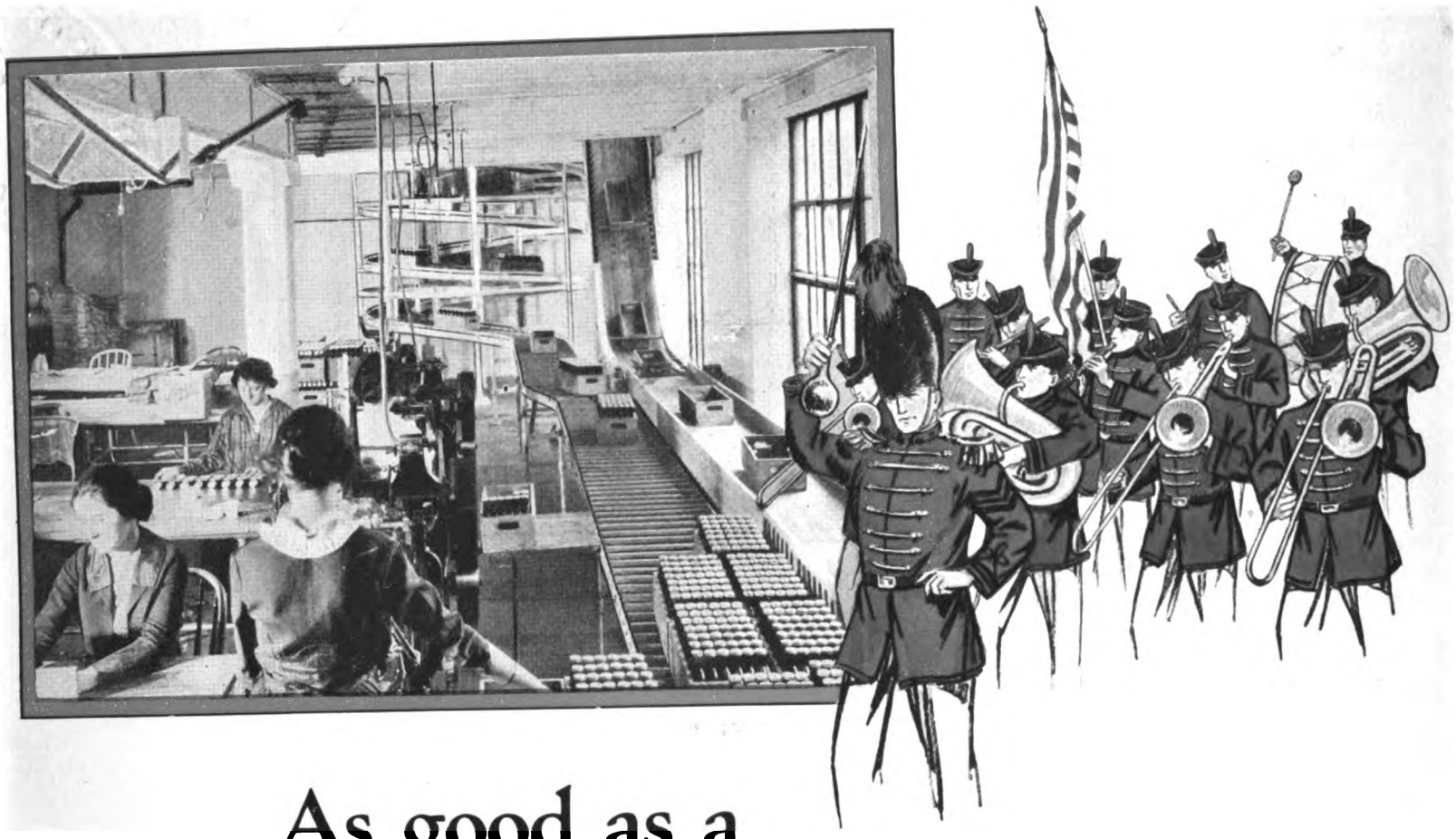
AUG 8 1922

Industry Illustrated



Men, Methods and Machinery of Modern Management

Digitized by Google



As good as a brass band in your plant

WITH a band blaring away at the head of the line, how little the marchers care for fatigue, heat, or dust! For it is the rhythm that makes marching easy.

Conveyors will bring this same rhythm to your plant. The workmen on your various machines become "tuned up" to a certain production rate set by the conveyors. You will find the output will greatly exceed the result from haphazard working. For the workers will unconsciously work at a more rapid rate and with less fatigue.

With conveyors, materials no longer stack up between machines, but go from process to process in an orderly way. This is the very life of efficient production, and only by mechanical conveying systems can this result be obtained.

THE LAMSON COMPANY
100 BOYLSTON ST., BOSTON, MASS.
Branches Everywhere

Lamson Conveying Systems

Digitized by Google

Industry Illustrated

CONTENTS

August, 1922

Editorial—A Matter of Monuments Page 7

Behind the Scenes at the Chicago Board of Trade 8
By *Robert H. Moulton*—Mechanical Devices of the World's Greatest Grain and Provision Market.

Concrete, as Used in Ancient Rome 10
By *H. H. Manchester.*

Burning, Grinding and Sacking a Mountain 12
By *H. Colin Campbell*—How Portland Cement is Made.

What the Worker Wants 15
By *Russell J. Waldo*—Different Viewpoints on a Contentious Topic, as Obtained by a Personal Research.

The Red Trail Bridge 16
By *George Emmons*—A Link in the Transcontinental Highway.

New Fields of Usefulness for the Electric Furnace 18
By *Raymond F. Fletcher.*

Pioneer Work in Developing the Radio Telephone 21
By *Jerome J. Green.*

Water Problems of the Boiler Room 22
The Feed-Water, Exhaust Steam, Feed-Water Cycle.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.,

Founded 1891 by

JOHN R. DUNLAP

Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — WALTER IVES, *Vice-President* — RUTLEDGE BERMINGHAM, *Vice-President* — JOHN R. DUNLAP, JR., *Secretary-Treasurer*

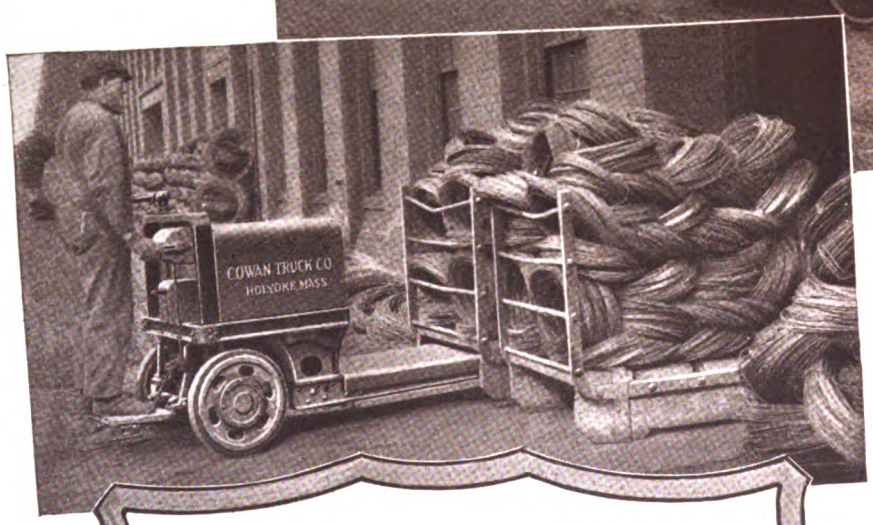
Vol. 3, No. 2. Subscription price $1.00 per year; single copies 10 cents.

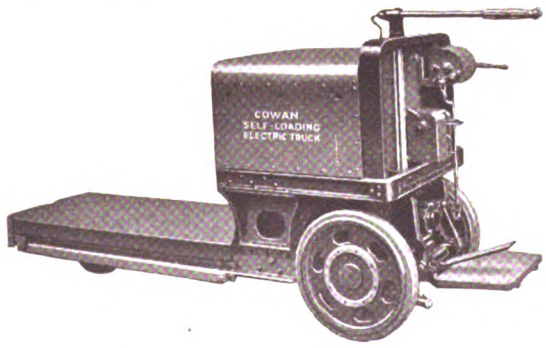
Copyright, 1922, by The Engineering Magazine Co., in both the United States and Great Britain.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google







Standard Equipment

Exide-Ironclad Batteries
G. E. Motors
Cutler-Hammer Controller
Brown-Lipe-Chapin Differential
S. K. F. Bearing Equipment
Alemite Lubrication

$9720 a Year Saved by Cowan Electric Lift Truck

And this is the saving in wages alone, in the Geo. W. Prentiss & Company plant at Holyoke, Mass., where one Cowan Electric Lift Truck replaces eight men.

In this plant manual methods of moving loads of rod and wire through progressive manufacturing operations have been replaced by the Cowan Lift Truck and skid method—practically eliminating all rehandling with its great waste in time and labor. Here, a Cowan Electric Lift Truck, operated by one man automatically picks up, conveys, and deposits skidded loads weighing hundreds of pounds; and, as well, hauls trailers.

A Cowan representative will gladly talk to you about effecting similar economies in your plant. Or we shall be pleased to send you a copy of Bulletin No. 5.

Cowan Truck Co., 6 Water St., Holyoke, Mass.

New York Office: Grand Central Palace Offices in Principal Cities

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

Digitized by Google

"I took this chance and Won!"

"Jim, old man, how did you ever put it over?" It was after business hours, and Perkins---who asked the question---had stepped into the office of the newly appointed General Manager for a talk.

Perkins was sore. Until recently, both Edmonds and he had been Department Managers for the J. J. Black Manufacturing Company. But something had happened during the week just past to change all this. The former General Manager unexpectedly resigned. The Board of Directors met to appoint a successor. Edmonds got the job.

Perkins was stunned. Not because he had expected to get the position himself, but because he didn't see why Edmonds had landed it. He was frankly curious.

"Jim, old man, how did you ever put it over?"

Getting Out of a Rut

And then Edmonds told him. "Perkins, you and I were both doing the same kind of work. We knew our respective departments pretty thoroughly, but right there our knowledge stopped. We were strictly "one department men," and as such, our value to the Company was limited.

"We both worked pretty hard but we didn't seem to get ahead. We seemed to have found our level —it was just high enough to keep us from becoming discontented.

"But one year ago I woke up. An advertisement did the trick. It was a Home Study Course Advertisement—but not the usual kind. This advertisement offered me a Course of Study in Industrial Engineering and Factory Management. As a Factory trained man it appealed to me at once as an intensely practical course. It told me in plain fashion what I wanted to know.

A New Kind of Training

"I saw a chance to train myself, during my spare time, in the fundamentals of big business—a chance to study the basic principles which govern factory organization and administration, the selection and layout of buildings and equipment, the planning and routing of work, wage systems and bonus plans, cost accounting, the generation and use of power, the valuation of property, statistical control and all other factors which are conducive to maximum production at minimum expense.

"I acted then and there. I took this chance and won."

Thousands of factory trained men, among whom are presidents, general managers, superintendents, industrial engineers, foremen, cost clerks, accountants, storekeepers, inspectors and plain, every day workers at the bench have seized the same opportunity which came to Edmonds, and have been helped to bigger jobs and better salaries by enrolling in the "Factory Management Course and Service" offered by the Industrial Extension Institute.

An Organized Course of Study

This remarkable course is the only one of its kind in the world. It is a practical, non-technical course for the practical factory man. It is based on the University plan of organized study, consisting of lectures, talks, reading assignments, text books, problems and model solutions to these problems. The Consulting service, which is part of the Course, is intended to help you meet and solve the questions which arise in your daily business.

No University has been able to present a Course like this one. It would be impossible to hire as teachers the sixty prominent industrial specialists who have personally cooperated to produce the Factory Management Course and Service. The combined experience of men like Gantt, Towne, Babson, Ficker, Steinmetz, Franklin, Going etc., each a recognized expert in his own particular field—has been systematically arranged and presented in plain, understandable language so that you can profit by it.

You will understand what men at the top think about the "Factory Management Course and Service" when we tell you that 35 per cent of the last 1000 men to enroll were managing executives. This does not include any man below the position of superintendent.

Wanted—The $20,000 Man

The demand for men trained in industrial management is far greater than the supply. Big business is literally begging for the man who can hold down a $20,000 job.

Show your will power! Make up your mind to get out of the rut of routine and begin *now* to prepare yourself for a bigger, broader job.

The man who studies this course conscientiously will quickly qualify for greater responsibilities, and, what is much more important, he will find his qualifications recognized and the responsibilities thrust upon him.

You have read this advertisement. Now take the chance it offers you. Tear off the coupon below and send for:

"Thinking Beyond Your Job"

—the interesting 100 page booklet that tells you, without any obligation on your part, everything you want to know about the Factory Management Course and Service.

INDUSTRIAL EXTENSION INSTITUTE
9 East 45th Street, New York City

Gentlemen:—

Send me without obligation your 100 Page Book "Thinking Beyond Your Job."

Name .....

Home Address .....

Position .....

Company .....

Co. Address .....

Ind. Ill. August, 1922

Digitized by Google

THE MOST ECONOMICAL AIR COMPRESSOR AND VACUUM PUMP

NASH HYTOR

THE HYTOR COMPRESSOR is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

The rotor, the only moving part, is cast in one piece, the blades being rigidly reinforced by shrouds. The rotor is mounted on a short, stiff shaft supported at each end by the highest grade annular ball bearings mounted outside of the casing.

As the peripheral clearance is large, there is no possibility of the ends of the rotor blades coming in contact with the casing.

The original high efficiency is maintained indefinitely in continuous service.

The air is thoroughly washed during compression and contains no oil.

Hytor compressors occupy very much less floor space and are much lighter in weight than reciprocating compressors. They run without vibration.

The cost of installation is greatly reduced as no expensive foundations are necessary.

No expert attendance is required as there are no adjustments to make. The cost of upkeep is negligible.

Hytor compressors are quiet in operation.

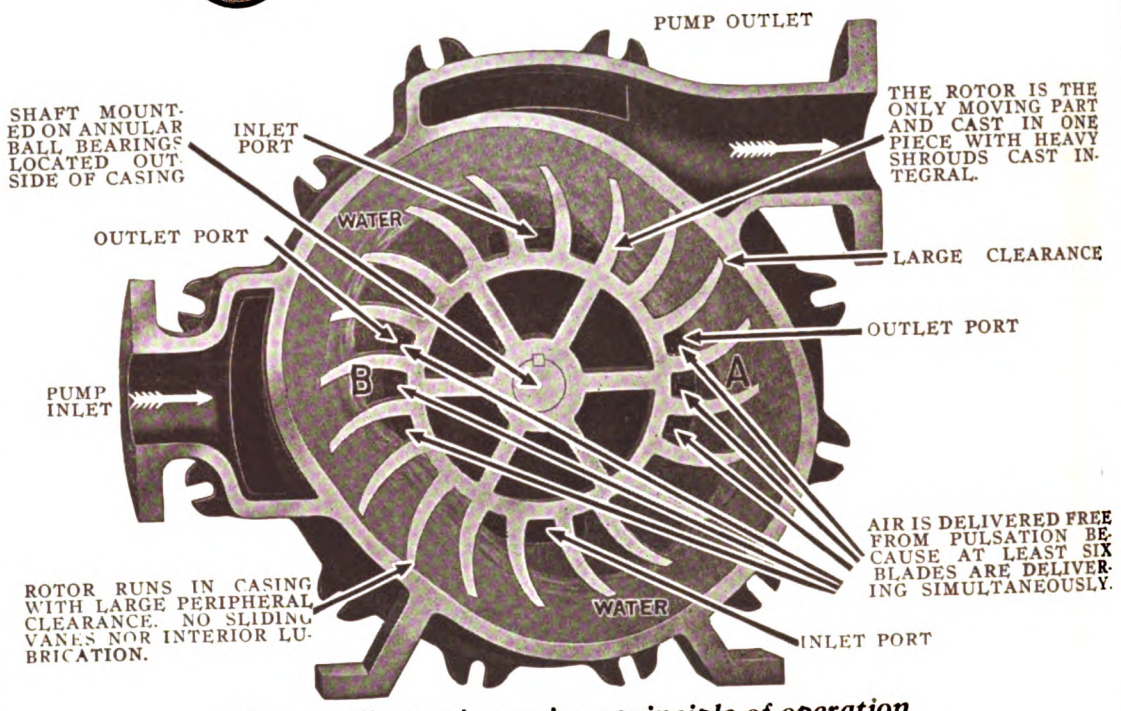
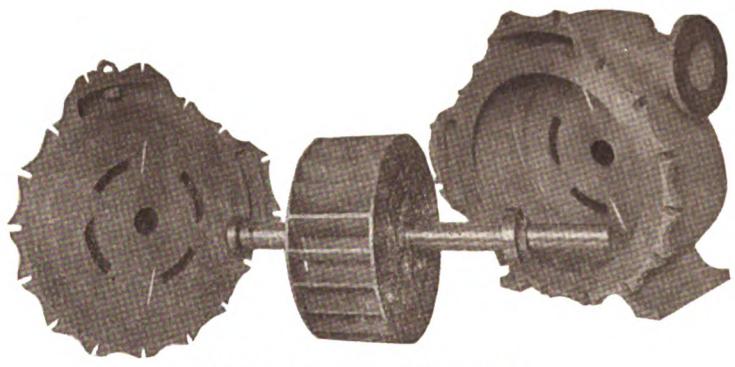


Diagram illustrating unique principle of operation



All the parts of the Hytor

A ROTOR in hydraulic balance revolves freely in an elliptical casing filled with water. The water, turning, with the rotor, and constrained to follow the casing by centrifugal force, alternately recedes from and is forced back into the rotor, twice in a revolution. As the water recedes from the rotor it draws in air through the inlet ports. When the water is forced back into the rotor by the converging casing, the air is first compressed and then discharged through the outlet ports.

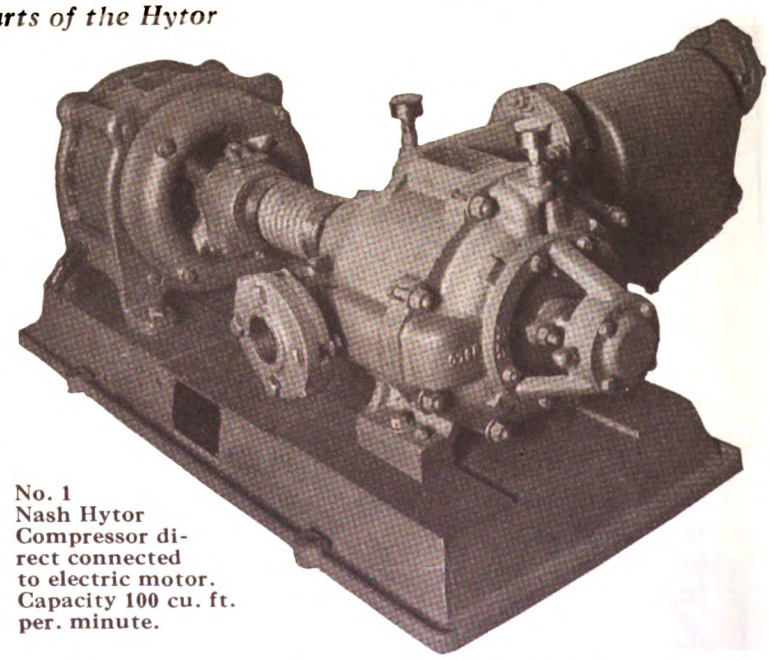
This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.



At pressures up to and including 15 lbs. per square inch, and vacuums up to 20 inches of mercury, the Nash Hytor affords the simplest and most economical means for handling air or gas, for all of the usual purposes where air under pressure is required, and they can be used on many special services for which the ordinary compressor is not adopted.

It is common practice in handling mildly acid vapors to re-circulate thru the pump an alkaline solution for the protection of the cast iron structure of the pump. In handling chlorine gas, concentrated sulphuric acid is re-circulated.

Air handled by the Hytor is delivered absolutely clean and free from dust or oil; a great advantage in the agitation of good products or in absorption processes where diffusion of air is accomplished by blowing thru filters, porous blankets or small orifices.



No. 1 Nash Hytor Compressor direct connected to electric motor. Capacity 100 cu. ft. per. minute.

5

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps
- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps

NAME.....

POSITION.....

COMPANY.....

ADDRESS.....

NASH ENGINEERING CO.
SO. NORWALK, CONN. U.S.A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

A Matter of Monuments

OF the ancient Seven Wonders of the World, only one remains—and that the oldest of them all, the Great Pyramid of Cheops. Built of huge blocks of stone, this monument stands some four hundred and eighty-one feet high and seven hundred and fifty-five feet broad at the base—a structure built solely by man-power.

According to earliest recorded history, when Cheops became king of Egypt some 6,000 years ago, he closed all the temples, abolished religious sacrifice, and made all the Egyptians labor on his monument—working in relays of 100,000 men every three months. And, says Herodotus, the ancient historian, in order to obtain the money necessary to complete this pyramid Cheops sacrificed the honor of his daughter, who built herself a smaller pyramid of the stones given her by her lovers.

We know that the stones were sawed by means of jewelled bronze saws set with corundum or diamonds. How they were transported after being sawed, and how the stones were set in place, remains an unsolved riddle. Nor do we know exactly how long it took to complete the work—though it is known that Cheops reigned for about twenty-six years, and this pyramid was his life-work.

The enforced labor of one hundred thousand men employed for probably a quarter of a century—enforced labor which interfered with the people's accustomed pursuits and took no care for their wishes or happiness—and all for the glorification of one man!

Contrast this with the most modern of industrial Wonders of the World—the Ford Motor Company. Founded on the vision of one man for supplying a commodity of universal use, quicker and cheaper transportation, this undertaking has grown into a stupendous project whose development has not yet even begun to reach its full scope.

Started only twenty years ago, dependent not upon the power of a king to draft labor, but upon the ability of a man to attract labor; employing this labor not for self-aggrandizement, but for the realization of a universally beneficial idea; handling this labor not to interfere with the worker's happiness, but instead increasing both his happiness and his self-respect through common sense methods—and thereby, in a period of strikes and general unrest establishing the enviable record of never having had any labor troubles—these things, and others too numerous to mention, make this a monument beside which the Great Pyramid of Cheops sinks to insignificance.

It is not birth, but brain-power, that makes a man powerful today and enables him to make a lasting impression on his times. It is not the size of his creation, but the measure of its benefit to others, that determines the greatness of the monument by which his memory shall be preserved to future ages.

Digitized by Google

Behind the Scenes at the Chicago Board of Trade

Mechanical Devices of the World's Greatest Grain and Provision Market

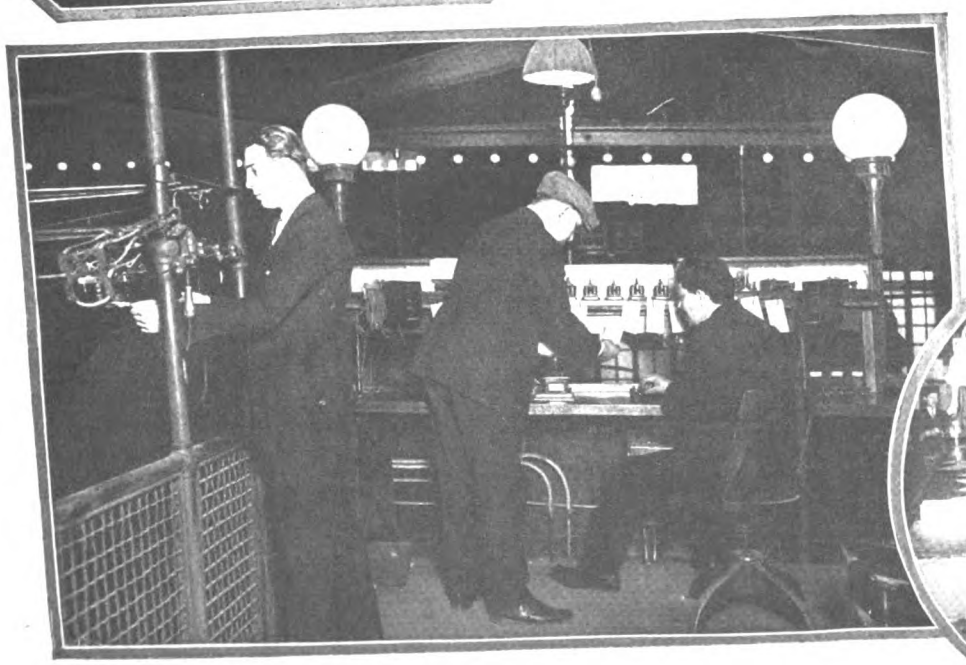
By Robert H. Moulton



Telephone operators signaling orders to brokers in pits.



Man at right writes prices on slips of paper and passes them to man at left who stamps them with chronograph (shown under his right hand) and hands them to telegrapher above.



Man in center stamps slips of papers on which prices are written with a second chronograph and hands them to telegrapher (seated) who transmits the information by Morse code to office of the ticker company.



At the right—Telegraph department of the Board of Trade.

CHICAGO is the greatest grain and provision market in the world. Here four hundred million bushels of grain are received annually, and six hundred million pounds of pork. And the Chicago Board of Trade, on whose floors trading in wheat, corn, oats, rye, barley, and pork products takes place, is an integral part of the distributive center by which this great food stream is regulated; the Board may, in fact, be called the very nerve-center of the grain trade of the world, since here are reflected world-wide conditions as regards growing crops, and the movement and consumption of crops.

There are few outside of the grain and provision business, however, who know that the Chicago Board of Trade itself does no business, but merely provides a place where buyers and sellers the world over, through their representatives, meet and trade in these commodities.

In order that buyers and sellers may have all information possible to guide them in reaching their opinions as to values, the exchange acts as a clearing house of data upon

Digitized by Google



Quotation tickers at left; news or broad-tape tickers at right.



Sending keyboard of the news or broad-tape ticker.

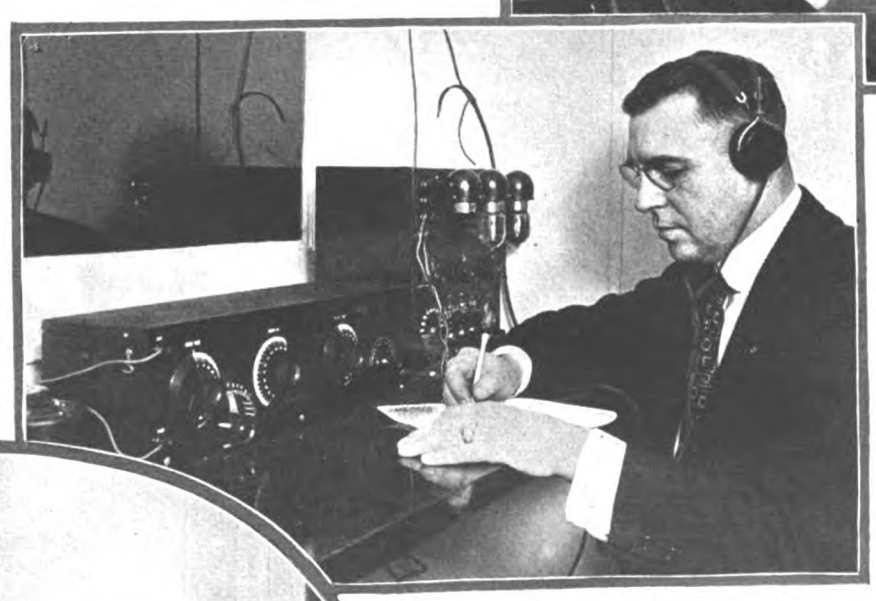
crop conditions, shipments, visible supply, and so forth. Through a wonderful system of news service, necessitating the cooperation of thousands of correspondents and agents, there is collected here all information which is likely to have any effect upon the trade, including prices of the different commodities in every considerable market throughout the world, and this information, with absolutely no restrictions, is sent broadcast for the benefit of producer and consumer alike, without prejudice and without partiality.

There are two classes of transactions on the Chicago Board of Trade. The first is what is known as the "spot" or cash transaction and takes place in much the same manner that sales of other commodi-

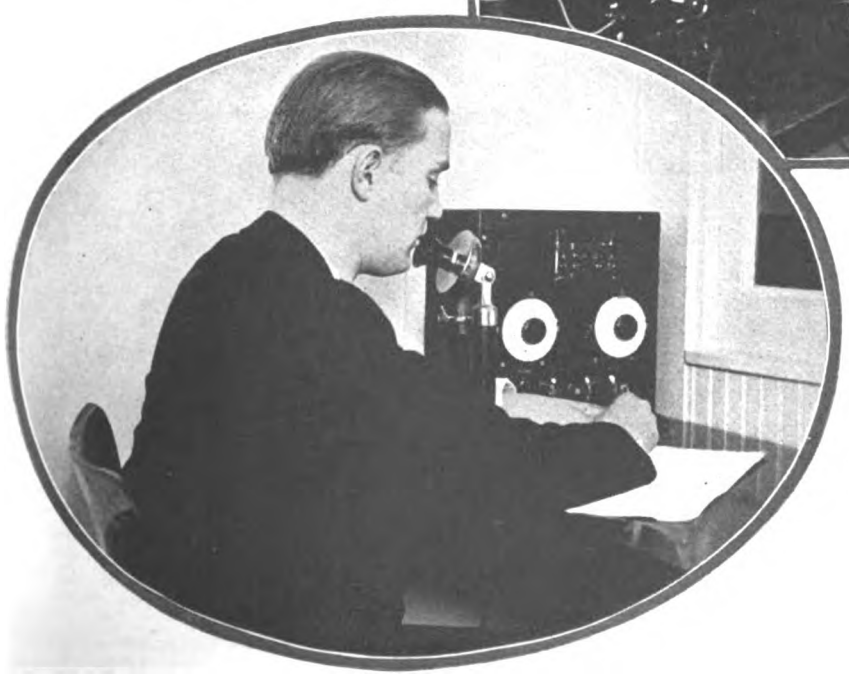
(*Continued on Page 26*)



Ticker keyboard operator receives prices by Morse code (through medium of telegraph sounder) from telegrapher near the pit and retransmits it over the line to the tickers.



At the left—Radio department of the Board of Trade, showing receiving apparatus, used in verifying information sent out by the Board of Trade and in receiving information from other stations.



Showing how the news or broad-tape ticker prints items.



Left—Radio department of the Board of Trade, showing sending apparatus.

Digitized by Google

Concrete as Used in Ancient Rome

By H. H. Manchester

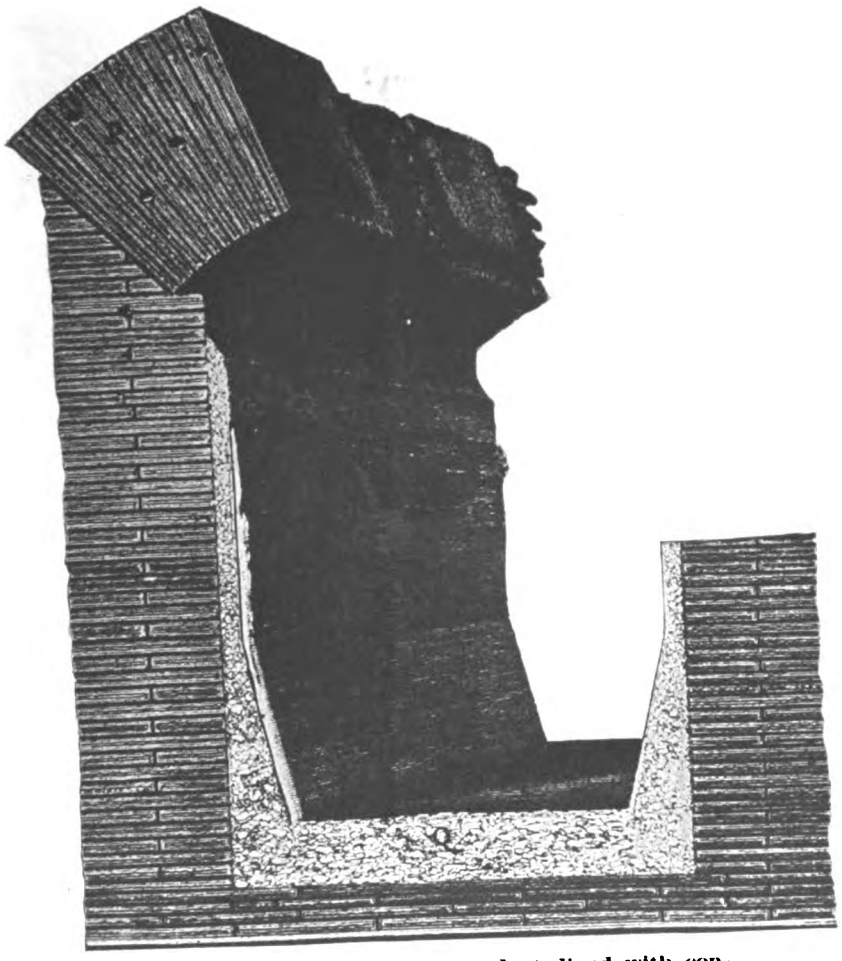
ALTHOUGH the Romans were very far from having the artistic architectural sense of the Greeks, they were immensely greater engineers, and as practical as Americans have been charged with being. They made a habit of looking over everything they found around them or in the countries they conquered, and applying it to the upbuilding of Rome and other uses of their own. At some time or other,—there is no record of just when,—the Romans discovered that the lava or rocks of the district which had been covered by volcanic eruptions, made a cement which was unaffected by water and would even harden under water. They of course knew nothing of the chemical reasons for this phenomenon, although at the period there was considerable discussion about this pozzolana, or burnt earth, which constituted the cement.

Vitruvius, the Roman architect who lived about the beginning of the Christian Era, gives his version of the nature of pozzolana in a passage which runs in part as follows:

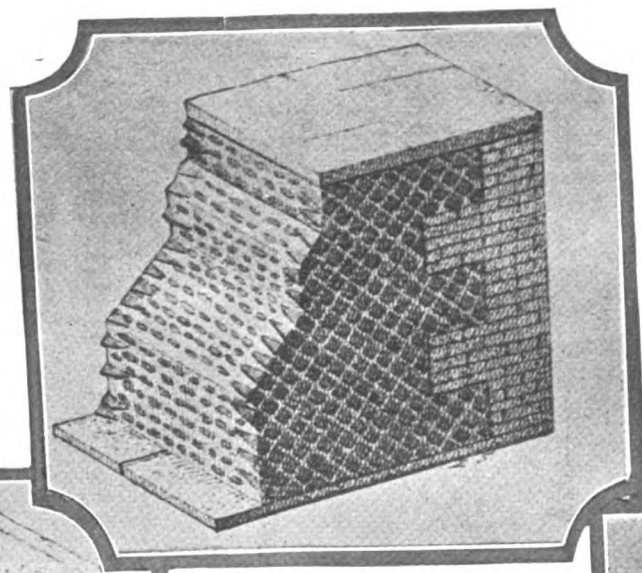
"There is also a sort of powder which by nature itself causes remarkable results. It is found in the district about Baiae and in the neighborhood of the towns round about Mt. Vesuvius. This substance, when mixed with lime and rubble, not only produces strong buildings of other kinds, but even when piers of it are built in the sea, they set hard under water. The reason for this seems to be that the earth on the slopes of the mountains in these districts is hot and full of hot springs. This would not be true unless the mountains had under them great fires of sulphur or alum or asphalt. So the fire and the heat, coming up hot from far within through the fissures, make the soil there light, and the tufa found there is spongy and free from moisture. Hence when the three substances, all formed on a like principle by the force of fire, are mixed together, the water suddenly taken in makes them cohere and the mixture quickly hardens so that it sets into a mass which neither the waves nor the force of the water can disintegrate.

"The sort of spongy-stone found in this region is not produced everywhere, but only about Aetna and among the hills of Mysia, which the Greeks call the "Burnt District," and in other places of the same singular character. Since in such places there are found hot springs and warm vapor in excavations on the mountains, and the ancients tell us that there were once fires over the fields in those very regions, it seems certain that moisture has been driven from the tufa and earth by the force of fire, just as it is from limestone in kilns."

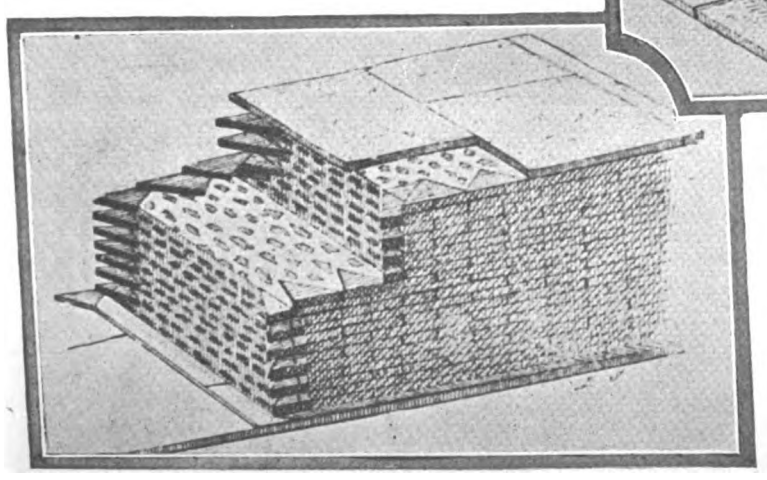
It is a sad commentary on Vitruvius' remarks, that the



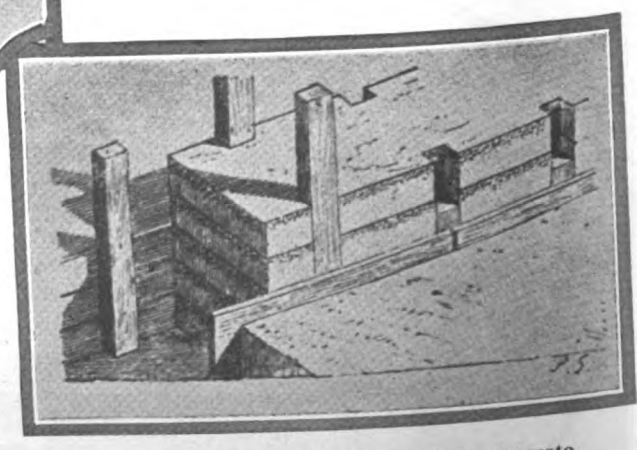
An ancient Roman aqueduct, lined with concrete and finished off with cement.



Reticulated facing on concrete, as used in an ancient Roman wall.



Cross-section, showing one of the methods used by the Romans in facing off concrete work; triangular stones or bricks embedded in the mixture.



The Roman use of molds in their concrete construction. Only very recently have we made any radical improvements in the forms or molds over those used two thousand years ago.

Digitized by Google



A bas-relief on Trajan's column shows the manufacture and use of concrete slabs by soldiers for constructing breastworks.

volcanic eruptions which he placed in the almost forgotten past, were so soon renewed and swept over Herculaneum and Pompeii.

At first the Romans in their concrete regularly made use of lumps of tufa, but later they employed lava, travertine, broken bricks, and all the chips from the stone mason's yard.

Employing this concrete, they developed a new style of architecture in which great spaces were covered with vaults and domes cast in semi-fluid concrete. This gave the form of the arch without the heavy thrust which would have resulted from true arches.

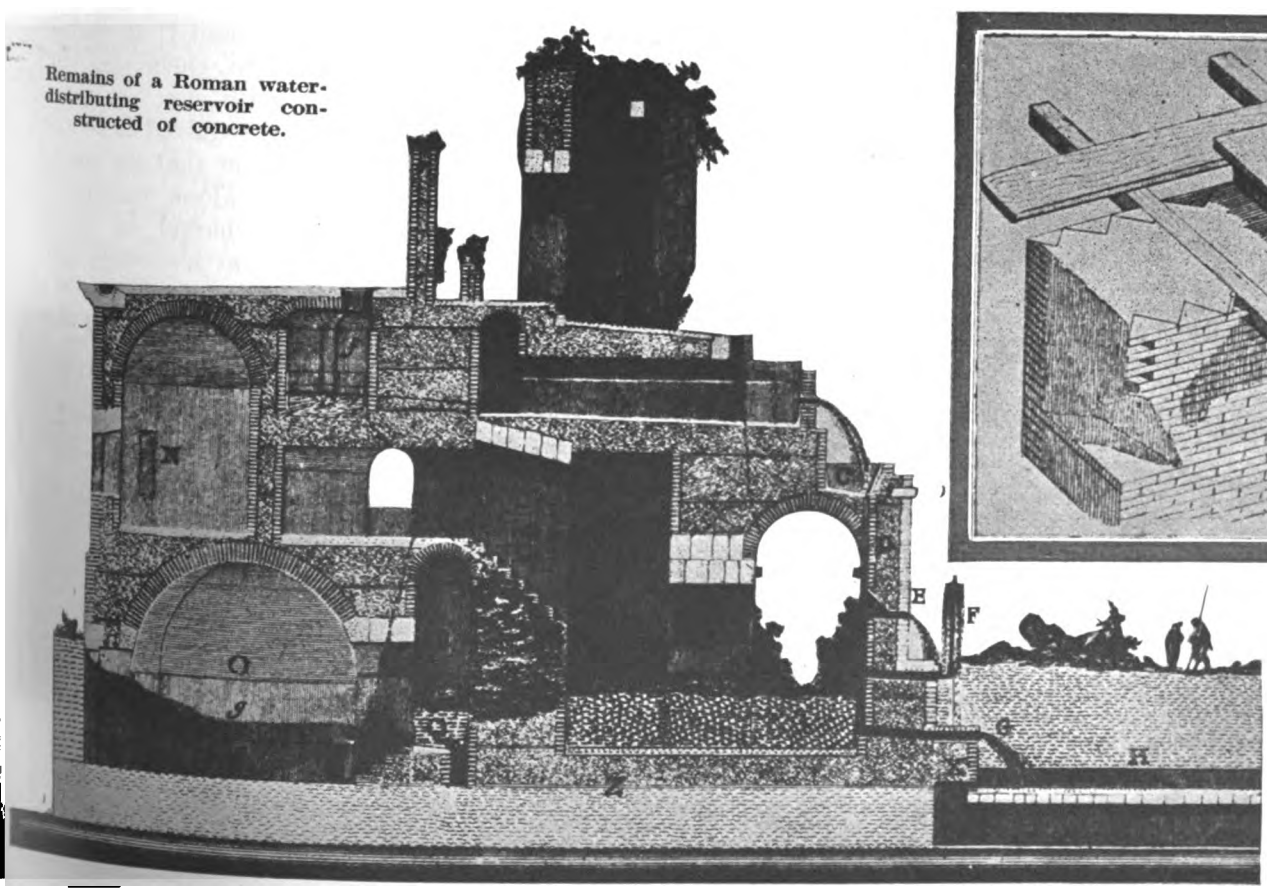
Massive walls were constructed with the use of molds. Upright timbers from 10 to 15 feet long were fixed in rows on each side of the wall to be made. Then planks about ten inches wide were nailed to them so as to form a mold into which the half-fluid mixture of pozzolana, lime, and stones was poured. From the remains it may be seen that a tier of concrete about three feet high was made at a time, in order to allow for proper drawing and setting. When this was hard, another tier was cast on top of it, and when necessary the mold was removed and placed on top of the latest tier.

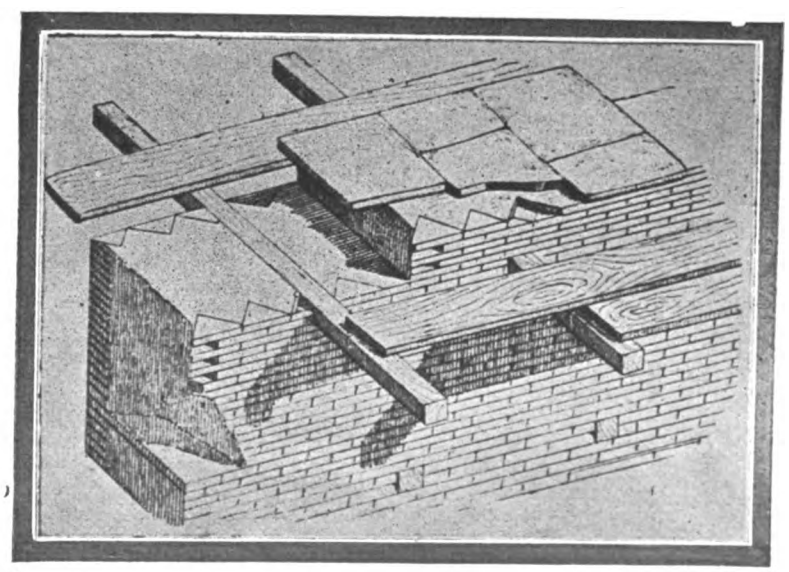
The foundation was left of uncovered concrete, but the upper walls, for the sake of appearance were usually faced with brick or stone. The walls of the pantheon for example, were of concrete about twenty feet thick; while the facing of brick was only about half a foot in thickness. There were various geometric methods of arranging the brick, the most popular of which seems to have been the opus reticulum or net-work pattern.

Just why the Romans

(Continued on Page 42)

Remains of a Roman water-distributing reservoir constructed of concrete.



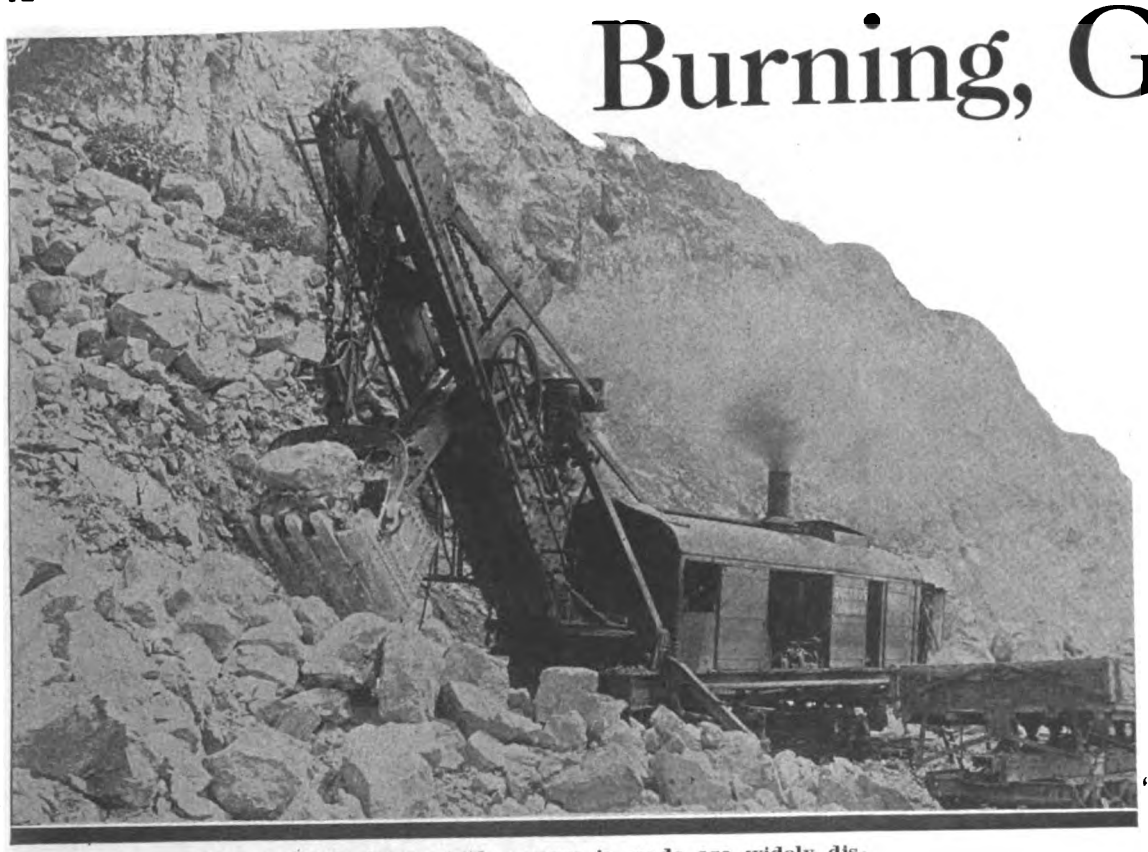


Layers of concrete interspersed with brick slabs and faced with brick. A common method of wall construction at the dawn of the Christian Era.

Digitized by Google

Burning, Grinding and *How Portland*

BY H. COLIN



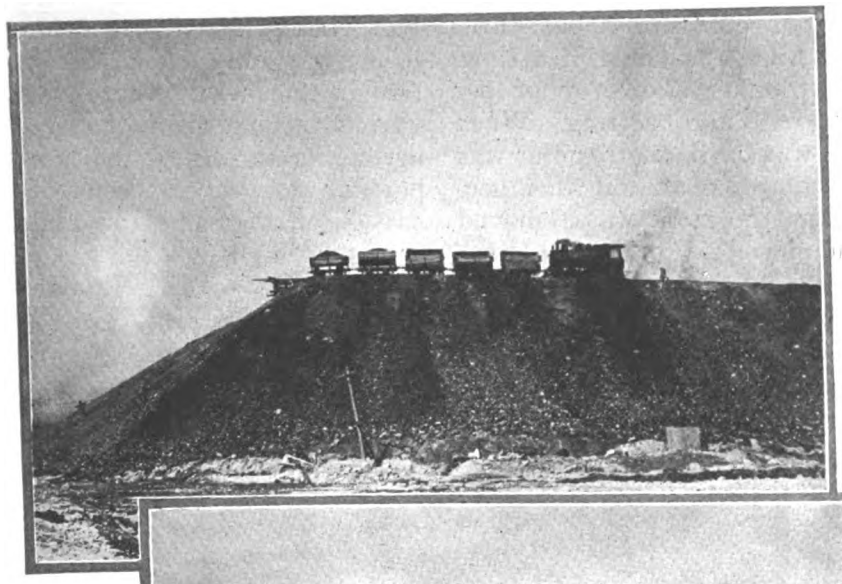
The materials from which cement is made are widely distributed in practically inexhaustible supply. But it is a long stretch from rock in the quarry to the finished product known as portland cement. This picture shows the face of a cement rock quarry from which some of the raw material is obtained **after blasting. In 1921, 14,000,000 pounds of explosives were used by cement manufacturers in loosening or breaking up rock so that it could be handled by the mill crushers. Incidentally, there were but seven fatalities recorded as the result of using this enormous quantity of explosives. This is probably explained by the ceaseless accident prevention campaigns carried on among workmen by the individual mills.**

THIS is a real mountain. From it there comes an average of 400,000,000 sacks of portland cement a year—100,000,000 barrels. A trip through a cement mill shows many sidelights. Nearly one hundred different processes must be brought to bear upon the rock blasted from the face of the quarry before the resultant dry-as-dust material can be given its commercial name.

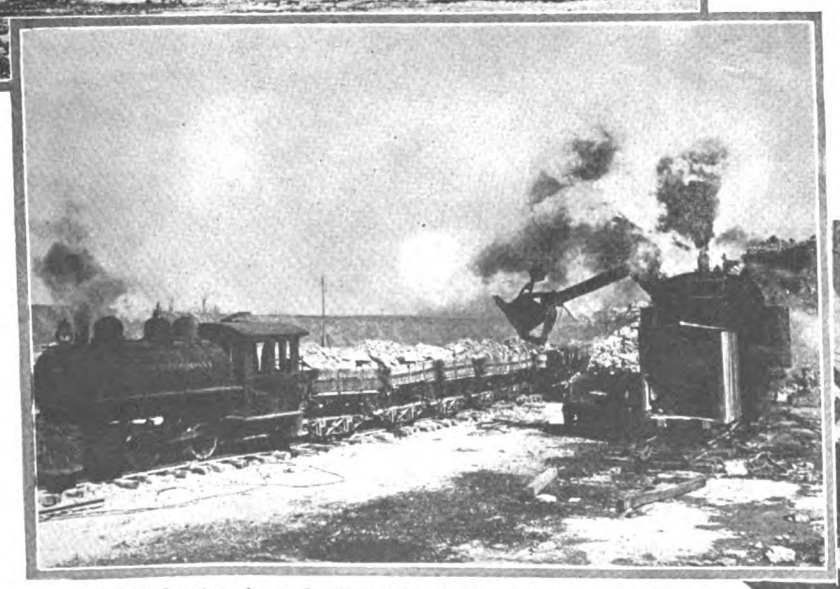
Drilling in the limestone and shale quarries naturally precedes blasting. Then for the twelve-months' production you must shoot off 14,000,000 pounds of dynamite or other high explosives.

Not all that goes into a barrel of cement comes out. It takes one ton of rock to make three barrels of cement—a loss somewhere of 800 pounds of raw material. Pop-shooting follows blasting in order to break large rock into pieces that can be handled by the steam shovel for loading into the cars that haul the raw material to the crusher.

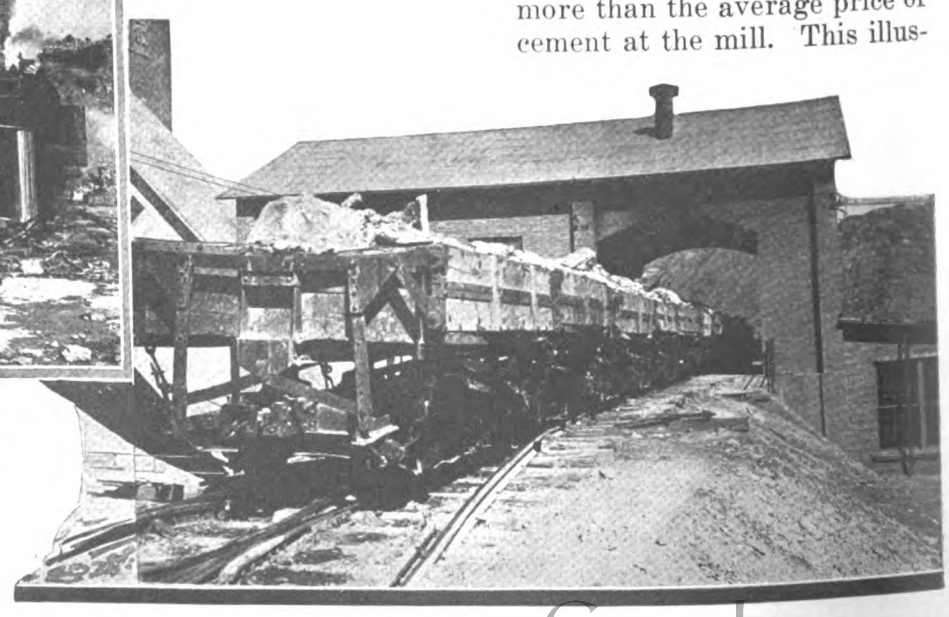
Power in enormous volume must be directed toward crushing this material, drying it, grinding it, handling and rehandling to and from storage, conveying to elevators, kilns, finishing mills, etc. An idea of the power required is learned from the fact that the electrical energy alone required to produce a barrel of cement would cost at household rates more than the average price of cement at the mill. This illus-



Not all is gold that glitters, as is evidenced by this photograph which shows a portion of the huge quantity of "wasted" material that must be stripped from the top of the cement rock deposit. This has to be moved a sufficient distance away from the seat of quarrying operations so as not to interfere with that work and involves railroad tracks, cars, and locomotives, and frequent relocating of such tracks as the pile of waste increases.



After having been loosened by explosives, cement rock is loaded into dump cars and hauled to the crusher house where it is reduced in size by putting through powerful gyratory or similar crushers. See photograph at the right.



Digitized by Google

Sacking a Mountain

Cement is Made

CAMPBELL

trates the economies which industrial management effects.

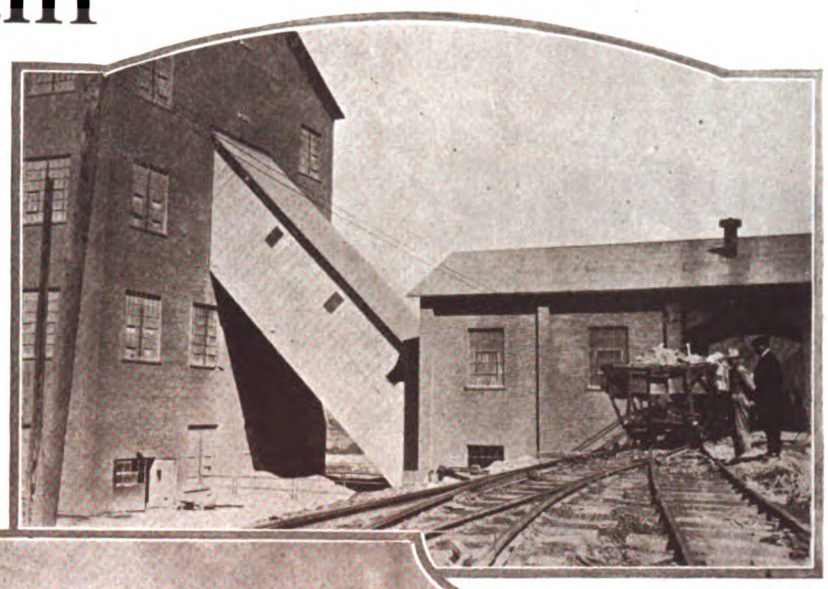
If you were a jobber in fuels you could well afford to spend a good sum of energy to get an order from the cement industry for its annual fuel requirements. The fuel bill of the industry for 1920 was represented by approximately 8,000,000 tons of coal, 2,300,000 barrels of fuel oil, and a good many million feet of natural gas. This makes anyone who has to think about keeping his house warm next winter, during a period of high coal prices, feel glad that he isn't running a cement plant also.

The industry has to go out in the market for other things that "go into" a barrel of cement. To keep machinery from wearing out several times as rapidly as it does in normal use and under normal care, nearly 3,500,000 pounds of lubricating greases were used and the same number of gallons of lubricating oils—a bill of around $1,000,000.

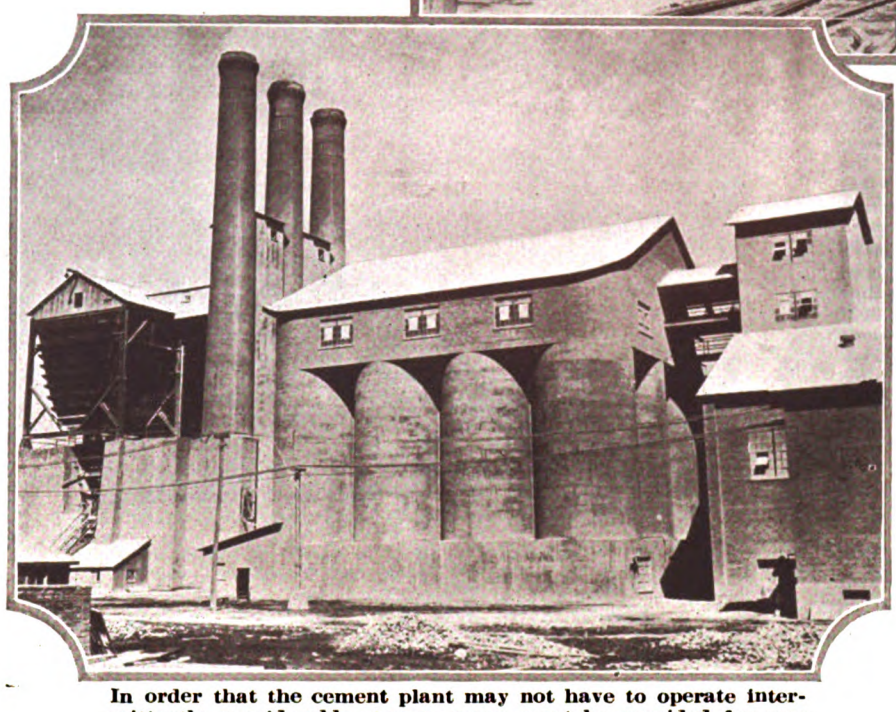
1,500,000 linear feet of belting, costing about $2,500,000 might have had something to do with "stiffening" the shoe market. At any rate we've got to have cement in this Concrete Age—and there's where some of the leather went.

4,000,000 fire bricks to line kilns.

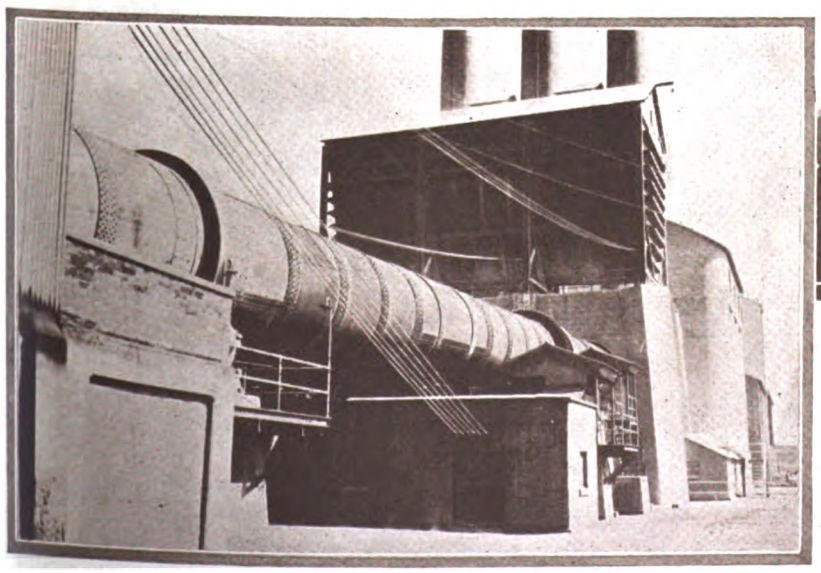
300,000,000 cotton sacks to keep the annual production moving—a pretty good single item of business for the cotton

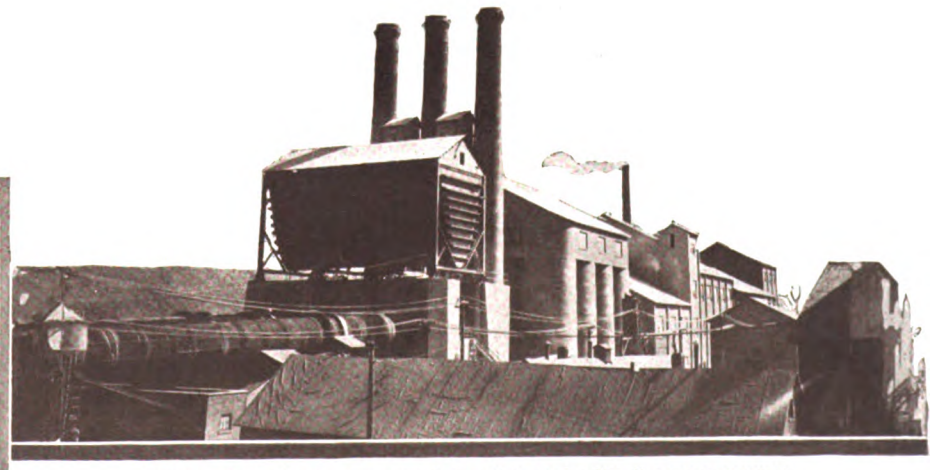


From the pit beneath the crusher, the reduced material is elevated in the inclined bridge shown in this picture to feed storage over secondary crushers. In these crushers the materials are still further reduced in size so that the particles after passing through dryers can be put through the first grinding preparatory to burning.



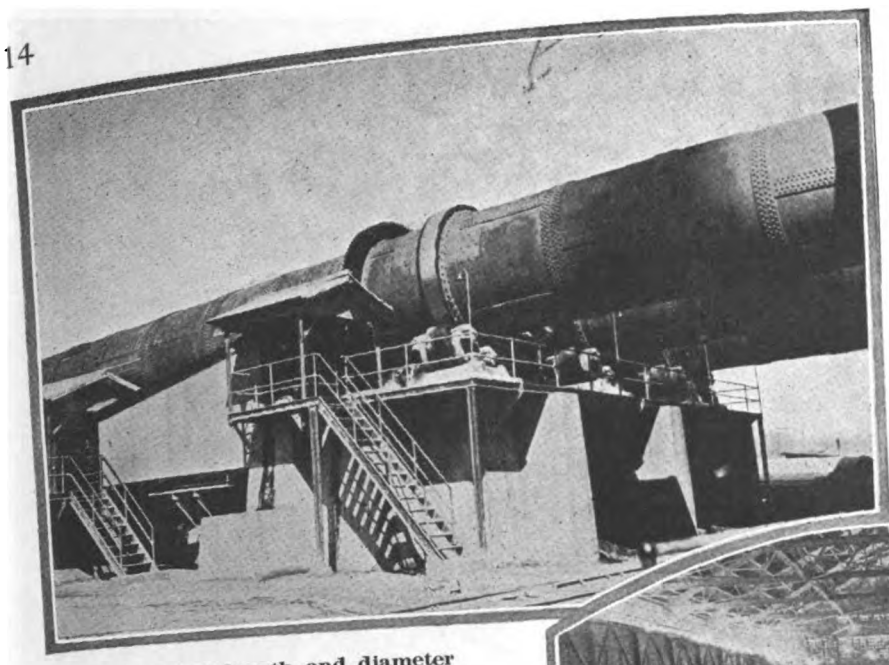
In order that the cement plant may not have to operate intermittently considerable storage space must be provided for raw materials. This battery of huge concrete tanks is for storing ground raw material. They must be water proof and capable of withstanding heavy internal pressure. They are therefore the subject of engineering design based on the requirements to be met.



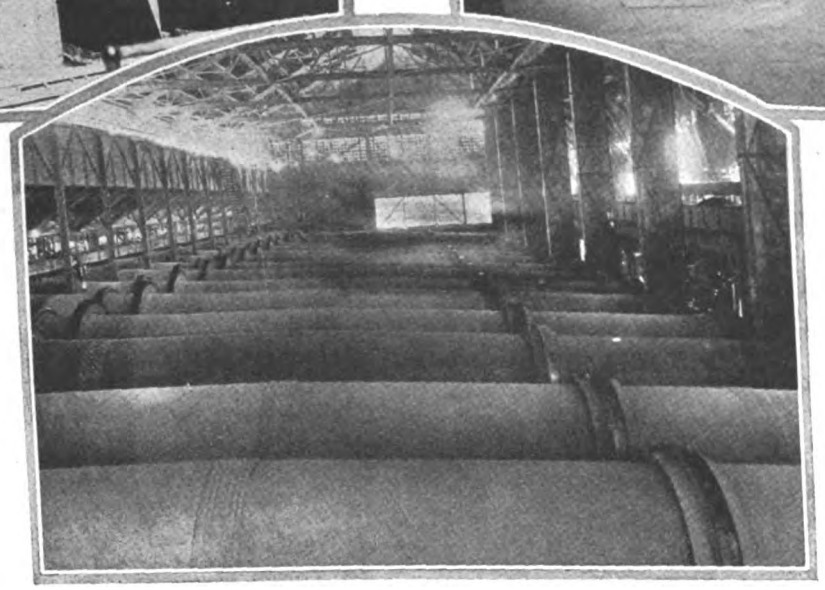


This view shows a part of the "straight-line" arrangement of the buildings in a modern cement plant in order to facilitate direct and uninterrupted progress of the handling of materials through various stages to finished portland cement. In the middle foreground are the kilns, next in line with the storage bins for raw materials referred to in the last photograph. The raw materials are fed into these kilns for burning and in their passage through the kilns encounter various degrees of heat until at the discharge end where fuel in the form of natural gas, oil, or pulverized coal is fed into the kiln, they are reduced to a glass-like, hard clinker. At the left is a close-up view of a kiln.

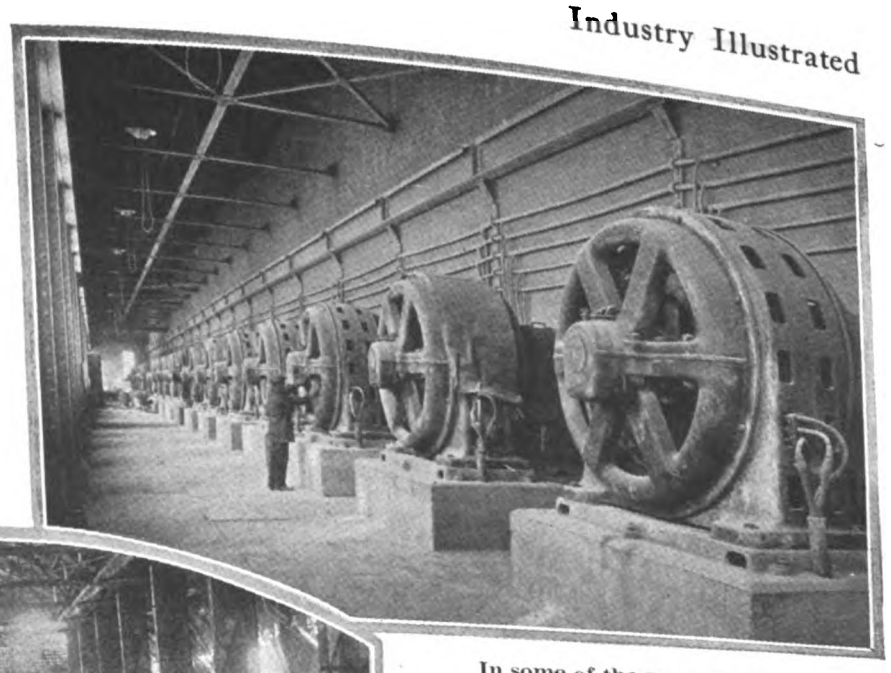
Digitized by Google



The immense length and diameter of cement kilns and the fact that they are charged throughout this length with a heavy load of materials requires that they be supported at suitable intervals on trunnions resting on firm foundations. The driving mechanism is also located at this point since the kilns must be revolved at a determined speed in order to properly expose the contents to the heat necessary for burning the clinker. It might be interesting to here mention that the energy of the power and coal required to make a ton of cement would be sufficient to drive a five-passenger touring car 1,200 miles over the finest type of paved road. This would cost in gasoline alone **more than two and one half times as much as the total cost of a ton of cement at the mill.**



These are the tube mills in which the clinker is ground. These are referred to on Photograph above.



In some of the more modern cement plants electric power reigns supreme. This photograph shows the motor room in a large cement mill, each motor being connected to a large cylindrical machine in which the clinker is ground into finished cement. These machines are known as tube mills. This pulverizing is done in part by using in each one of these mills tons of the hardest kind of steel balls and tumbling the contents around until attrition has reduced the cement to such fineness that more than 78 per cent will pass through a sieve having 40,000 meshes per square inch.

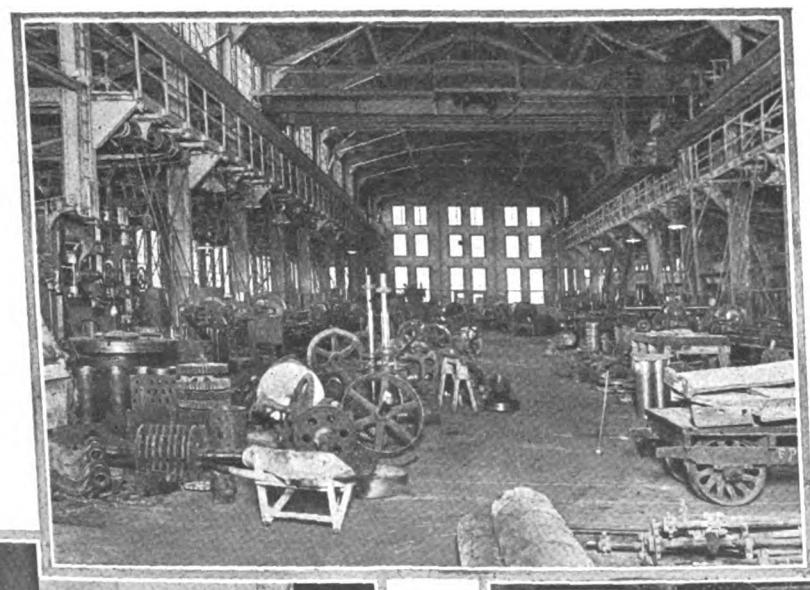
and textile industries. Incidentally, replacements of sacks each year require a strip of cotton fabric 30 inches wide and 23,000 miles long—7,000 acres.

Multiplication helps to show the importance of some things. If a single sack-filling machine had to work at sacking one year's consumption of cement, it would require 24-hour per day operation for 180 years to complete the job.

In cement manufacture coal is burned as a powder. It is a good deal like a blow-torch operation. 5,500 000 tons of the coal consumed by the industry was pulverized for use

(Continued on Page 38)

The larger mills maintain enormous machine shops in order that repairs may be quickly and effectively made.



Portland cement is a product resulting from mechanico-chemical processes. So-called standard specifications which have been formulated for the purpose of establishing minimum requirements of quality are very exacting. An exact balance of the raw materials used must be maintained at all times and to check possible variations in chemical content and physical requirements continual testing of both raw materials and finished product is carried on. The chemical laboratory of a modern cement plant is therefore a very important detail in manufacture.

The sacks are permanently tied at the top with wire ties and filled through a valve at the bottom. If all of the cement manufactured in one year was shipped at one time it would require 400,000,000 sacks at least to move it once and there would be no sacks left in the mill for future production. Consequently, there is an enormous amount of money tied up in sacks necessary to handle the output of the mills. It is estimated that 300,000,000 square yards of cotton-duck are required annually to maintain the stock of sacks necessary to keep the cement production of the mills moving. Because the sacks are valuable they are repaired as often as such repair will make them fit for further use.





Digitized by Google

What the Worker Wants

Different Viewpoints on a Contentious Topic, as Obtained by a Personal Research

By Russell J. Waldo

AFTER hearing unreasonable assertions regarding what the working man really wanted and what the employer *believed* he wanted I set about to discover what the worker really wanted and to get the information direct from him. There was in my opinion only one best method to use. This was to lay out questions and allow the worker to answer them.

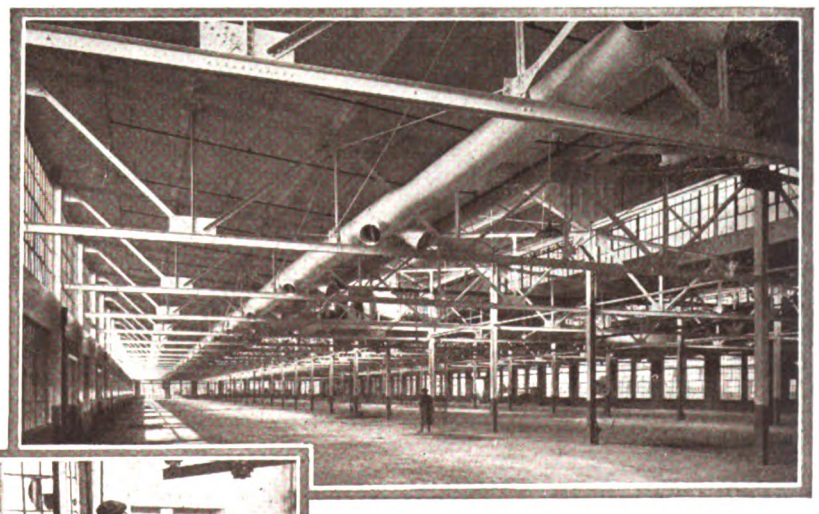
The questions asked in "The Employees Questionnaire" were put to a few over one thousand workers in Buffalo, Cleveland, Toledo, South Bend, and Indianapolis. As the findings were practically the same in every locality I shall not separate them as to locality. However, I shall give my figures for the various questions. In every case the worker was actually a worker in the production end of the game.



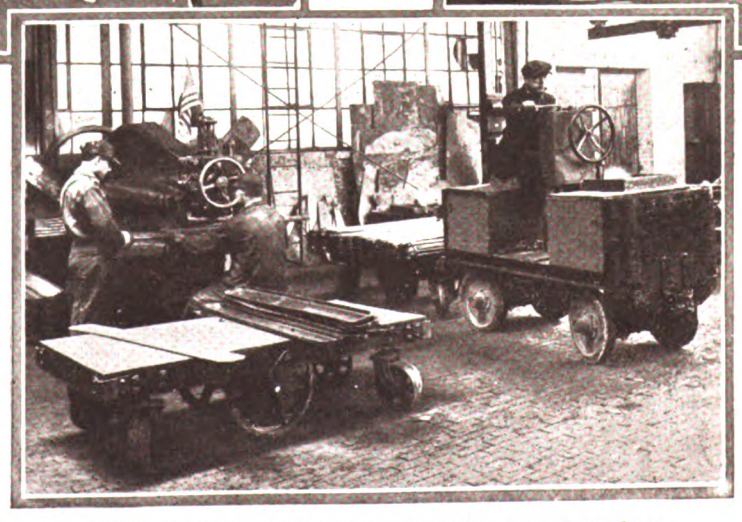
The average employer would be astonished to know how many men spend their rest periods in this pretty little nook on a factory property in New York State. Ask these men whether surroundings make a difference.



Below—A lunch-room which really fulfills its mission, both as a convenience and as an economy for the men.
(Photo Courtesy of Sani Products Co., North Chicago, Ill.)



Below—Light, air and ventilation were considered well worth attention in the planning of this building.
(Photo Courtesy of Ferguson Company, Cleveland, Ohio.)



These men not only appreciate the use of modern transportation methods, but brag about their organization—taking pride in "our factory" and "our methods."

Question 1—*In choosing a place to work do you look for a place where they want you to advance and give you every chance or do you go where they simply want you to work?*—brought out some very interesting information. Eight hundred and three would work only where they would be given every opportunity to be promoted. One hundred and twenty-three stated that they didn't care as long as there was work. One said that he had never been given a fair opportunity to advance and would like to have one to see what they were like. The remainder said it was immaterial to them.

In question 2—*Do you object to the first training which is often given in vestibule schools on entrance?*—I found no objections although one fellow said that "if the employer was half as anxious about your work after you were in as the instructor in the school was it would be a pleasure to work in some places."

Question 3—*Would you work in a poorly ventilated factory?*—with the exception of twenty-six, answers were against the poorly ventilated factory. The twenty-three did not care as long as the firm paid enough money.

Six hundred in answer to question 4—*Would you rather eat a warm meal in a company restaurant served at cost or would you rather carry your lunch from home?*—would rather eat a warm meal. Two hundred and seventy-five would rather eat at a company restaurant if they could get what

(*Continued on Page 42*)

Digitized by Google

The Red Trail Bridge

A Link in the Transcontinental Highway

BY GEORGE EMMONS

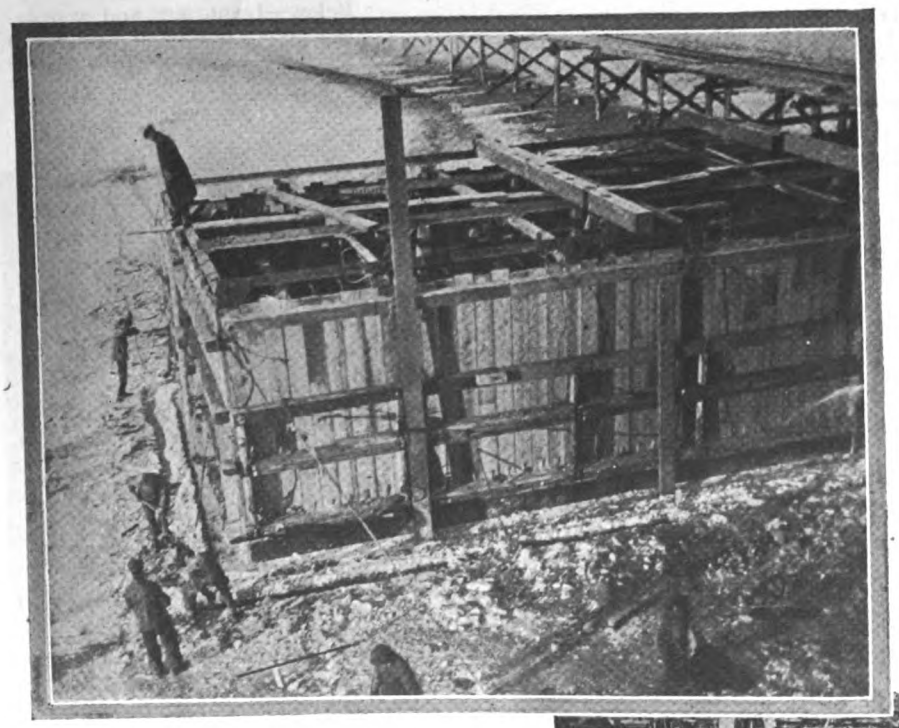


This span, finished last year, provides an important link in the transcontinental highway, bridging the Missouri from Bismarck to Mandan, North Dakota.

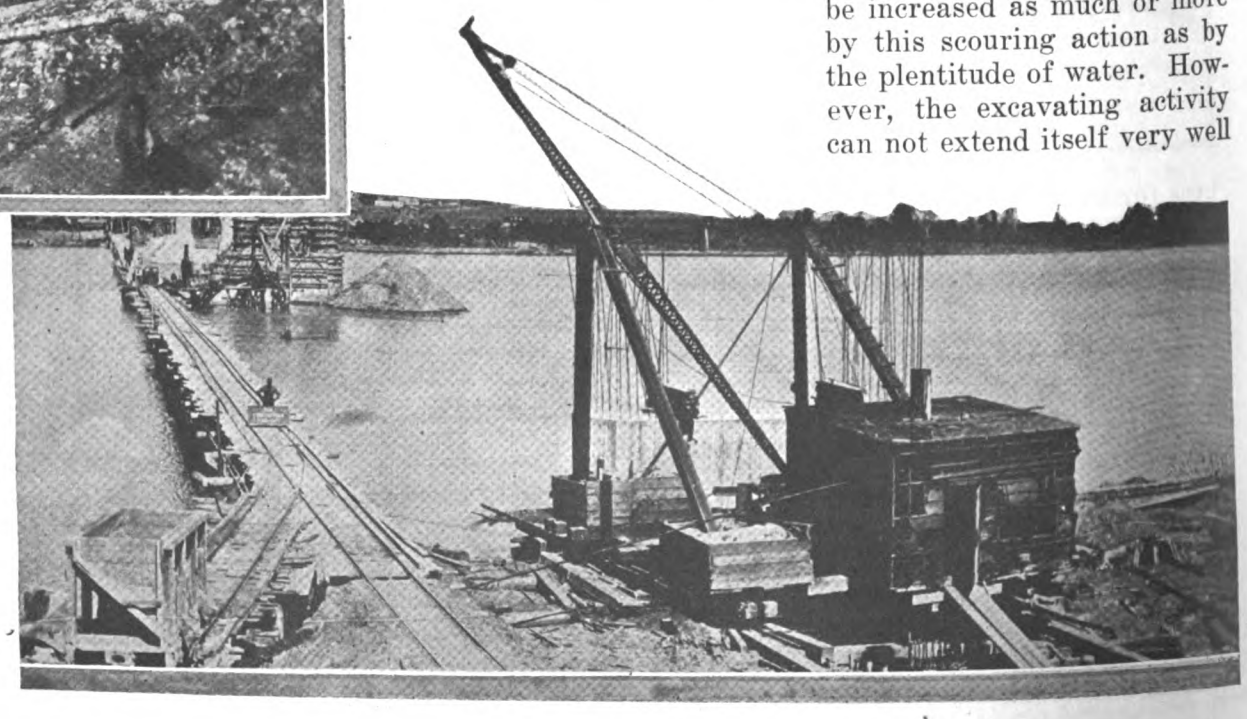
THE transcontinental highway from the East is, in North Dakota, known as the Red Trail. This notable road crosses the Upper Missouri at Bismarck. It would perhaps be more correct to say that the highway came to the bank on the east side of the river and resumed its course on the west side. In the days gone by, various methods of getting across were employed. If the traveler arrived in his auto in the summer time, he could generally cross by means of a ferry. But if the wind was high or if the river was at flood, then the ferry would as likely as not be out of commission for the time being. The passage across could ordinarily be effected in the winter time over the ice. There is a bluff on one side and anywhere from one to three miles of river bottom on the other. The river itself is far from constant in its width, the distance across varying from 1500 to 3000 feet.

As a matter of fact, the bridge crossings are not numerous and are said to be costly. However, a highway bridge is now about completed, which connects the capital of the state, Bismarck, with Mandan, on the opposite side of the stream.

In this region, the Missouri flows in a stratum of silt. This is disturbed at the flood seasons, a large part of the material being caught up and carried on. As the speed of the river declines at the close of the flood, other silt is deposited. The new locations of deposit do not altogether coincide with the locations from which the old silt was removed. The effect is the same as if the river bottom had had its silt shifted. The forgoing phenomena are due largely to the fact that when the flood begins the river digs down into its bottom of silt. The depth may at times be increased as much or more by this scouring action as by the plentitude of water. However, the excavating activity can not extend itself very well

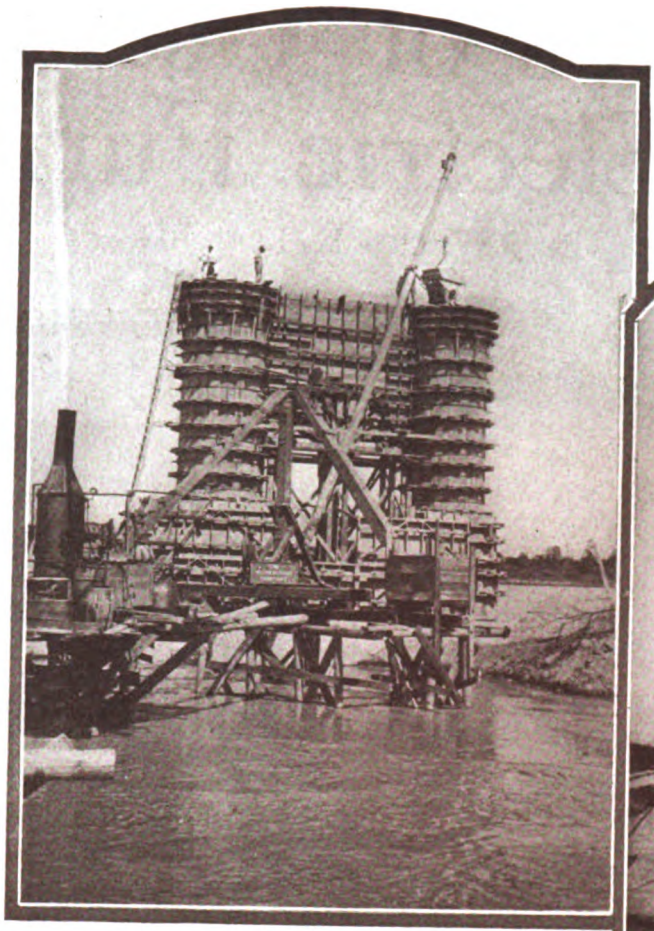


Above—sinking a caisson for one of the piers, in winter weather. Difficulty was experienced, owing to the inequalities of the clay river-bed.

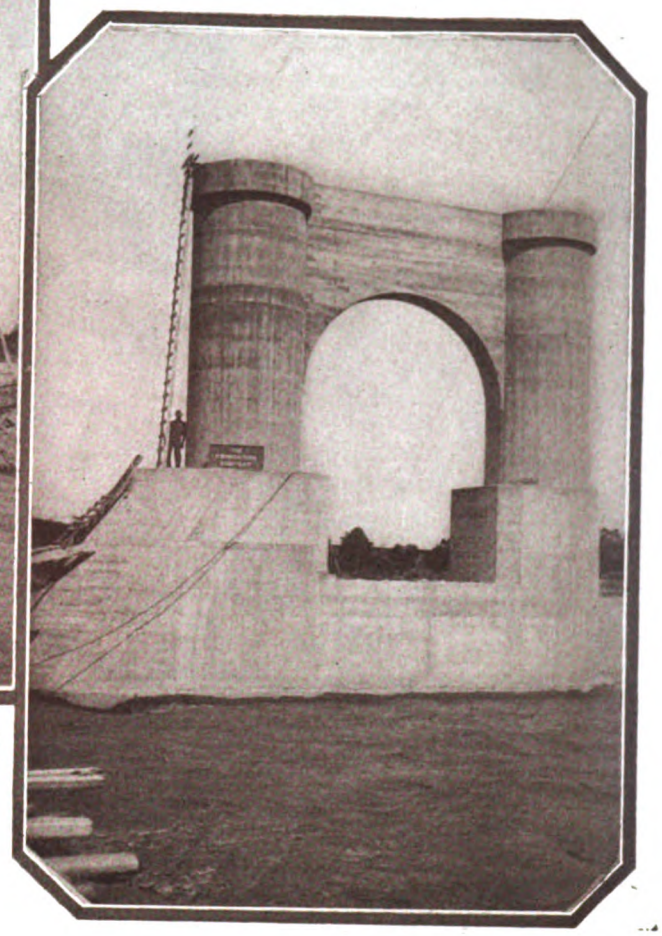


Temporary bridge and track for bringing concrete, etc., to the piers under construction. Total length of the finished bridge is 2428 feet.

Digitized by Google



Bridge pier under construction, concrete forms still in place, as well as falsework at the pier base.



At the right—one of the completed piers, photo taken in 1921, before spans were begun.

further than the top of an underlying stratum of shale clay. This stratum lies at depths varying from 30 to 90 feet below the level of the water when the river is at a minimum stage.

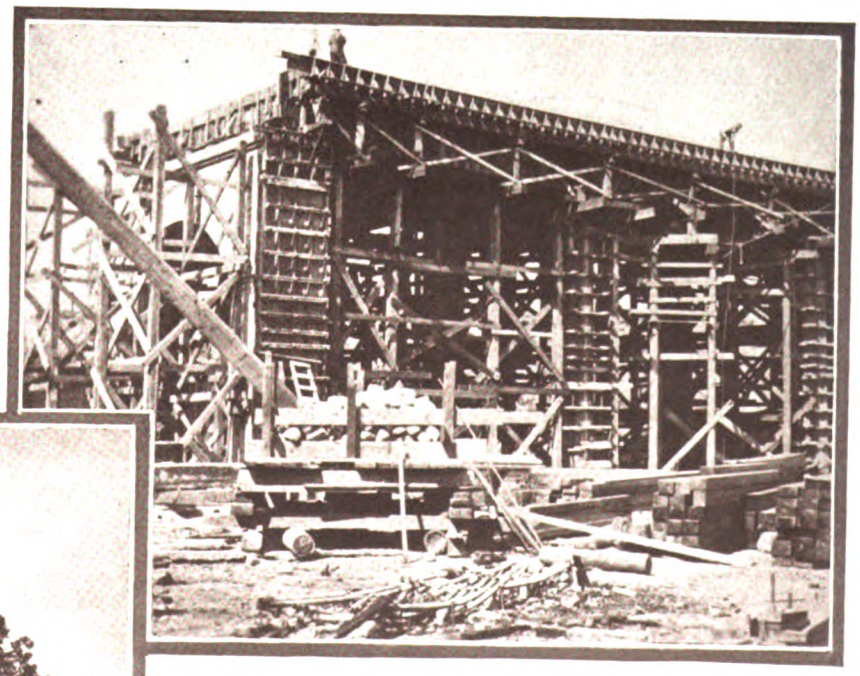
This underlying clay, limiting, as it were, the scouring action of the river, constitutes the uppermost stratum in which it is safe to place the support of the pier foundations. If the foundations are set higher, they will be exposed to the hazards of the grinding action produced by swiftly moving water carrying solid material.

The site selected is perhaps a mile downstream from another bridge, that of the Northern Pacific Railroad. This railroad bridge does not, it seems, have the best of locations, since a clay bank is already giving trouble to the railroad in connection with the east pier. On the other hand, the clay stratum which underlies the silt bottom is at a somewhat deeper level at the site of the Red Trail Bridge. Still, the site is on the direct route between Bismarck and Mandan, and this is a matter of economic value.

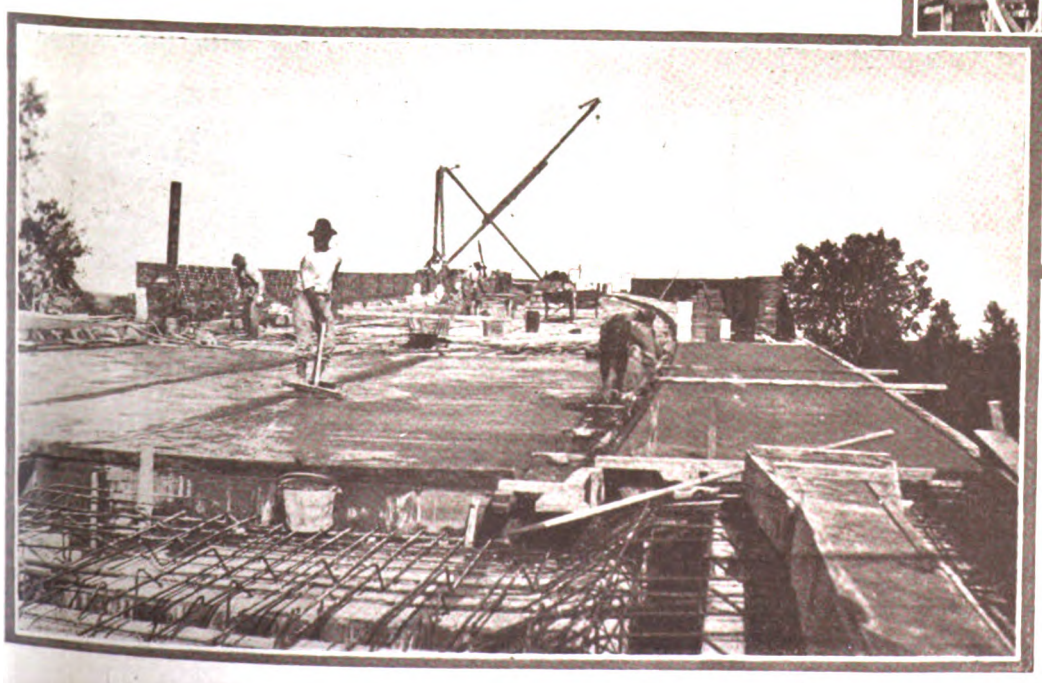
The bridge itself consists of three considerable spans, each measuring 476 feet, center to center. There is a concrete approach 400 feet long on the east, and one 600 feet long on the west. It will thus be seen that the total length of the structure is about 2428 feet. There is a central roadway 27½ feet wide and two side footways each 6 feet wide.

For some reason, the silt above the underlying clay stratum contains relatively few boulders and logs. Just why this should be is not altogether clear. Perhaps the best explanation is that the silt bottom

(*Continued on Page 53*)



Construction of the eastern viaduct approach to the Red Trail Bridge.



Laying the permanent roadway on reinforced concrete base. There are two foot-ways, and a vehicle roadway 27½ feet wide.

Digitized by Google

New Fields of Usefulness for the Electric Furnace

By Raymond F. Fletcher

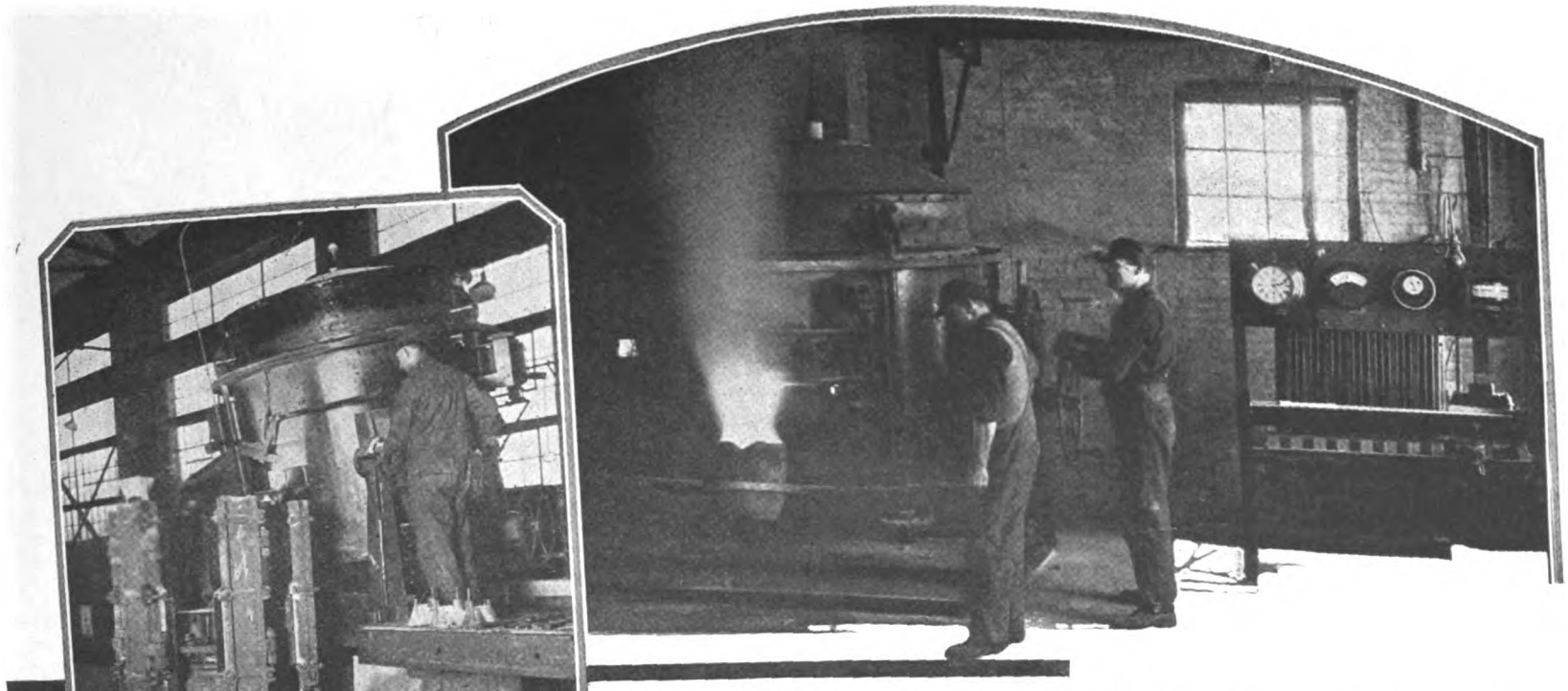


Fig. 1—Typical Brass Foundry Unit; a 1,000-lb. non-ferrous metal-melting furnace, of which more than one hundred installations are in use in American foundries. Larger units are the exception, because the foundryman wisely prefers a battery of small units, to avoid tying up production in case of shut-down for repairs.



Fig. 2—A One Ton Rolling Mill Furnace, pouring the metal directly into rolling mill moulds; which does away with crucibles and minimizes hand labor.

ALMOST every industrial manager is confronted with a heating problem quite aside from the question of providing warm and comfortable working quarters. If his plant melts metal of any kind, hardens dies, knives or tools, or subjects castings to any sort of heat treatment, he is interested in that very modern science of industrial heating which, by substituting electricity for other fuels, gains a degree of control heretofore unattainable in furnace equipment. The adoption of electricity in diversified industries has progressed rapidly, and each new field of usefulness concerns both the men directly connected with that industry

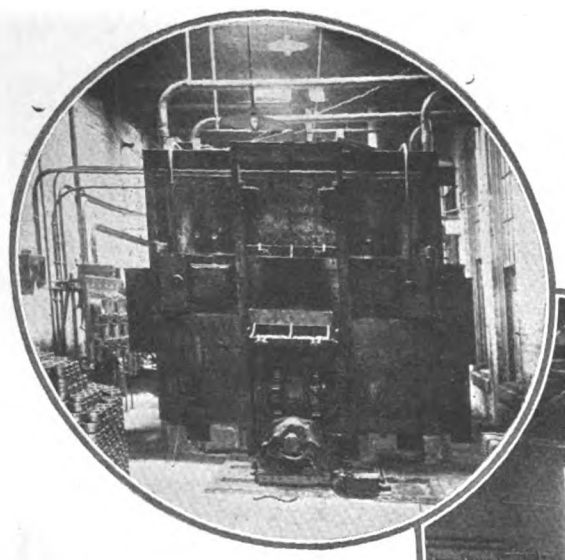


Fig. 3—At the Left: A typical Heat Treating Unit. This furnace is hardening ball races for bearings. Completely automatic equipment carries the material through hardening, quenching and drawing operations, without manual labor.

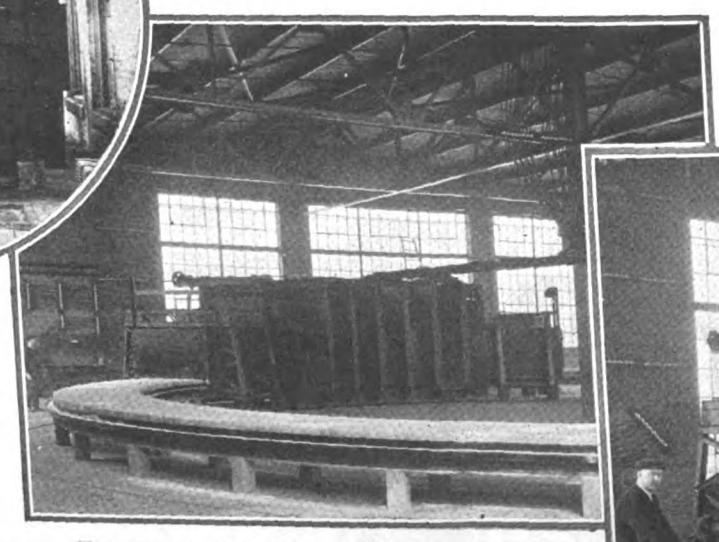


Fig. 4—At the right: Enamelling Equipment, showing the car furnace and the circular table over which it travels. Details are shown in succeeding illustrations

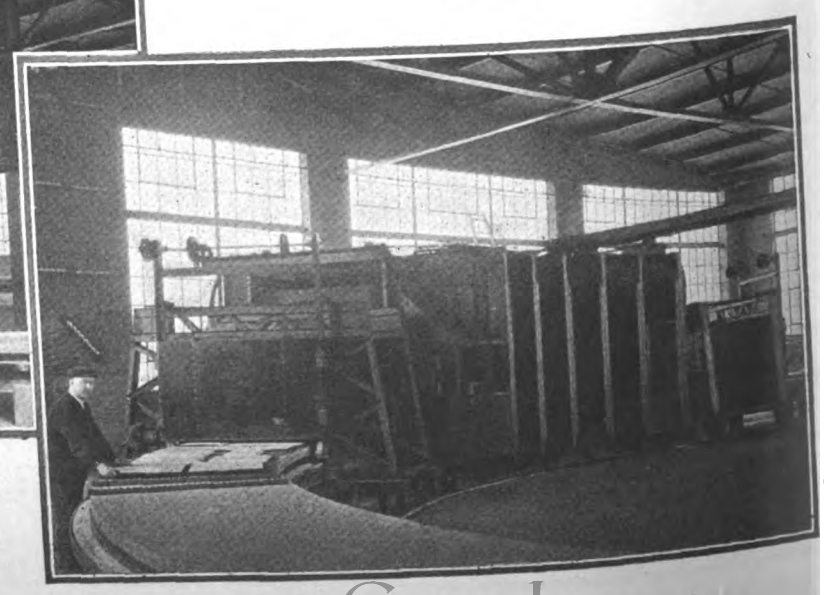
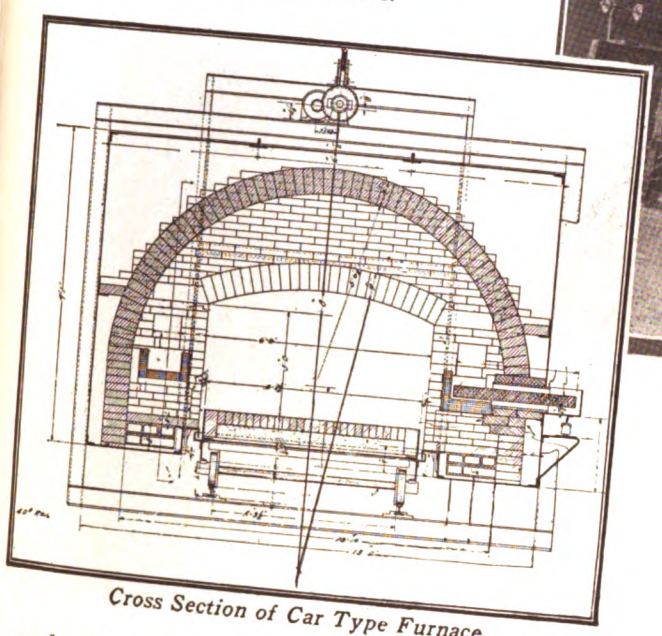


Fig. 5—At the right: Enamelling Equipment, showing how the ware to be enamelled is placed on the stationary circular table.

Digitized by Google

5-A—Below: This cross section shows the two rectangular carborundum channels or troughs, on either side of the heating chamber. The essential principle remains the same in the circular melting furnace.



Cross Section of Car Type Furnace



Fig. 6—At the left: Enamelling Equipment, showing the furnace car itself, which travels at regulated speed over the circular table on which the parts are placed; the speed being regulated according to the work, and the degree of heat likewise.

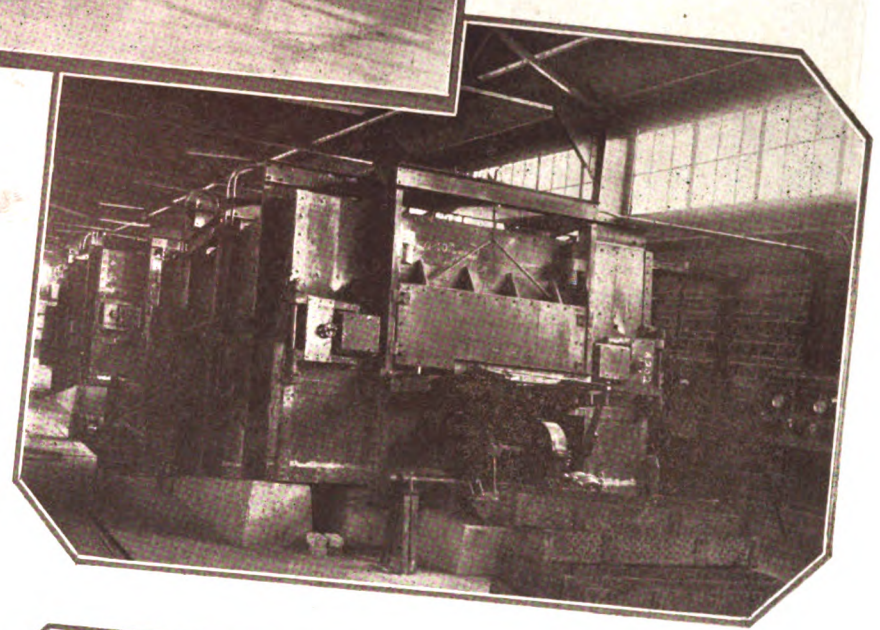


Fig. 7—At the right: Automatic Unit for Heat Treating Automobile Parts. The material is loaded into pans which are placed on the charging platform by motor-operated pusher.

and those progressive engineers in other fields who see in such development possibility of applying the same principle in their own work.

Beyond doubt, the United States leads the whole world in the electric furnace field, both as to the number of electric units in service, and also as to the diversity of application. In the whole world there are probably 1,000 furnaces melting electric steel, 300 melting copper zinc aloys in foundries, 200 casting metal in rolling mills, and fully 100 serving in chemical processes, doing high temperature baking, and making electrodes. One hundred other units are employed in heat treating and annealing, besides a large number used

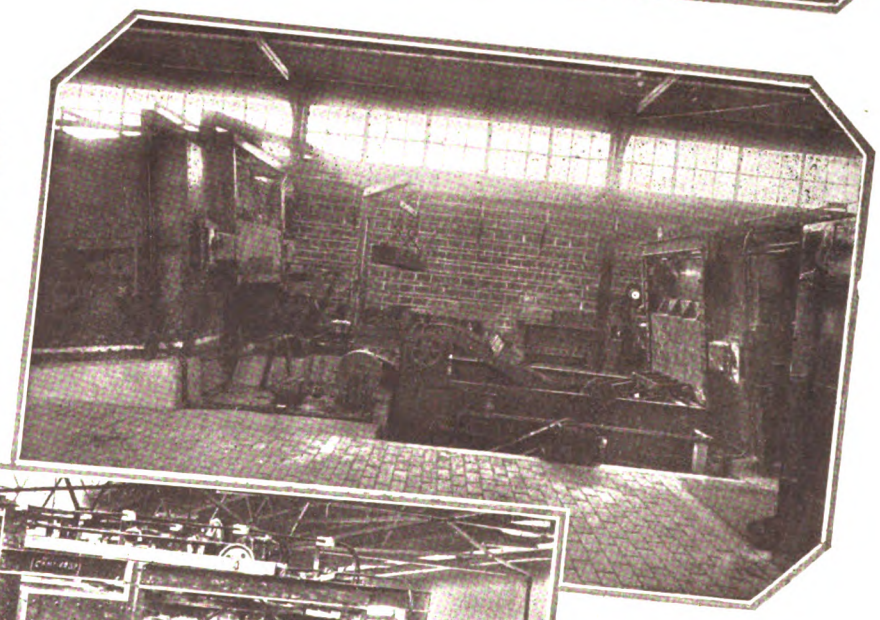
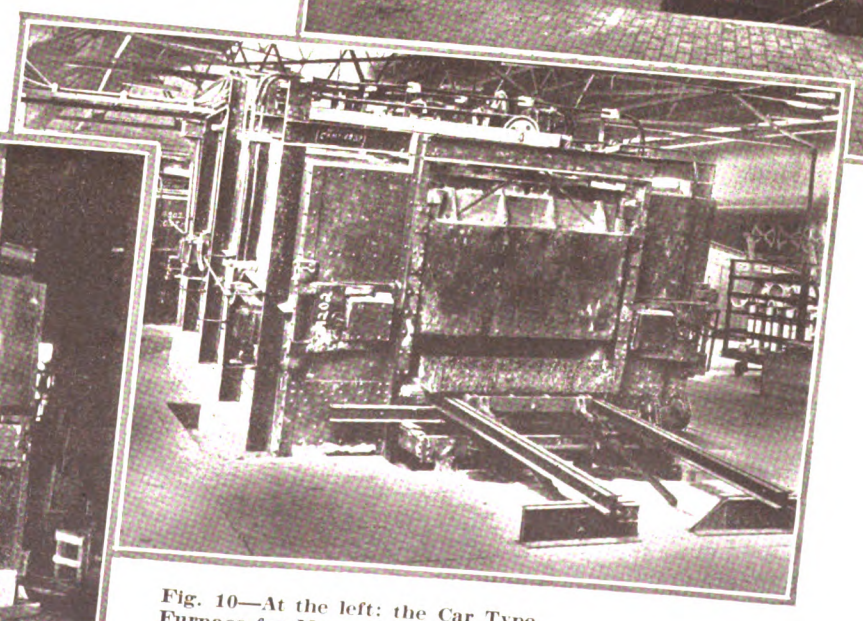


Fig. 8—At the right is shown the automatic transfer and quenching operation of the automatic heat treating unit. The time cycle is so arranged that the time necessary for the pan to pass from charging door to discharge end of furnace is exactly right for the designated heat treatment.

Fig. 9—Below, at the right, is shown the discharging end of the automatic heat treating furnace.



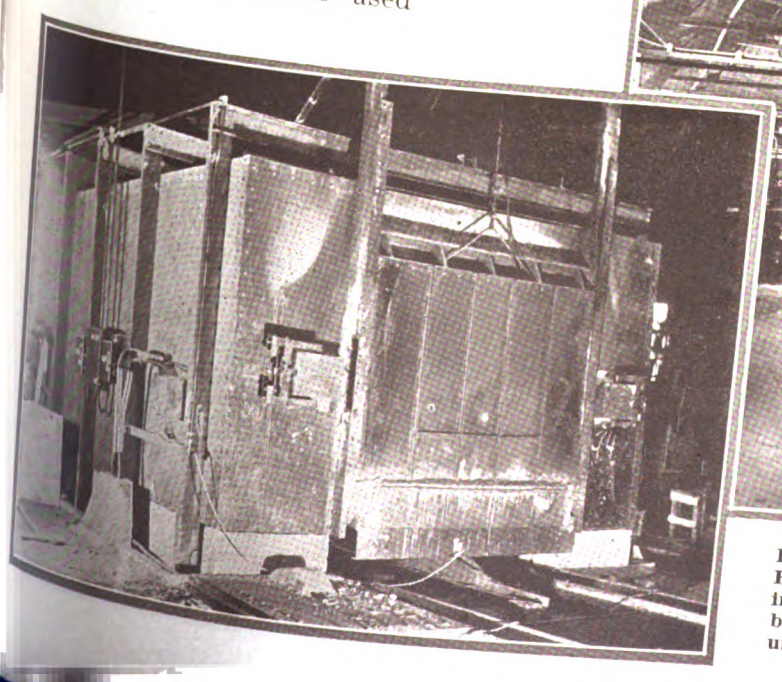


Fig. 10—At the left: the Car Type Furnace for Manganese Steel Castings, which eliminates the heavy breakage formerly met with due to uneven heat treatment before quenching.

Digitized by Google



Fig. 11—A pit Type Crucible Furnace, capable of holding two number 40 crucibles. For precious metals, the danger of loss in handling is reduced to a minimum.



Fig. 12—A ferro-Manganese Melting Unit, especially valuable because this alloy cannot be held in an ordinary furnace without loss, being extremely volatile. The resistance furnace, with its sealed melting chamber and non-oxidizing atmosphere, does away with this difficulty.

Fig. 13—Below: Pouring silver into molds, from crucible heated in the furnace shown in Fig. 11.



Fig. 14—Below is shown a hot charge from the car furnace (Fig. 10) ready to be transferred to the water quench.



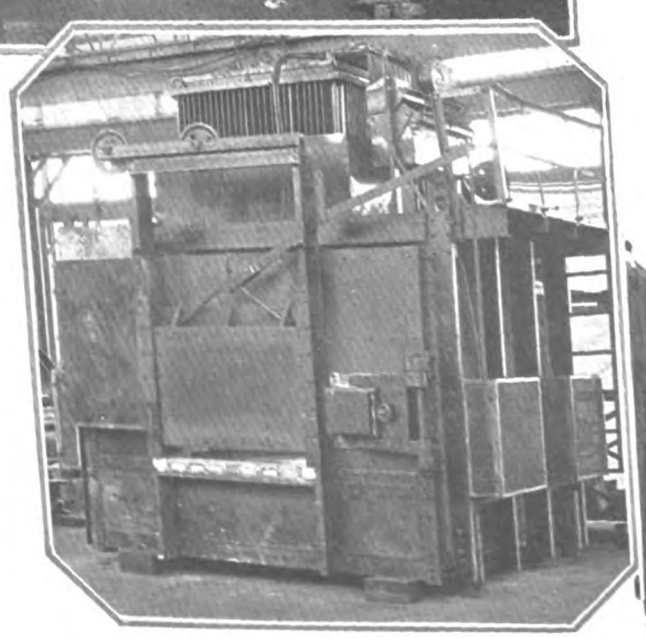


Fig. 15—Portable Electric Furnace, for heating automobile parts for stamping. A crane moves the furnace where required.

for laboratory work for japanning, and for other low temperature operations. Of the grand total, fully 1,000 units are in service in the United States.

There are but four fundamental types of electric furnaces, differentiated by their method of heat generations: the arc furnace, the granular resistor, the induction type, and the nichrome ribbon unit. The arc furnace produces heat by the contact of carbon electrodes, while in contrast, the resistance type has its heat source in troughs of carborundum, packed with granular carbon which is brought to incandescence by the passage of current through it. Of the other two types; the induction furnace has a vertical ring of molten metal which acts as a conductor, and the nichrome ribbon unit transmits its heat energy through series of strips of nickel chromium.

While all these types have met a wide application, the resistance type furnace undoubtedly has successfually entered more diversified fields of industry than any of the others. The illustrations in this article are all typical resistance type furnaces, but it must be borne in mind that each of the four classes of electric furnaces is rapidly broadening its field usefulness, and every month develops some successful application which was scarce even dreamed of a few years ago.

In the resistance type fur-

(*Continued on Page 48*)



Fig. 16—Below: pouring aluminum. This furnace has a hearth capacity of 500-lbs. of aluminum.

Digitized by Google

Pioneer Work in Developing the Radio Telephone

By Jerome J. Green

ONLY twenty-three years ago the newspapers of the whole world gave much space to an announcement. Mr. Marconi the pioneer radio man, had succeeded in sending signals from France to England across the channel a distance of 34 miles without any material connecting medium. This was called wireless telegraphy and with the devices then available it was really a remarkable accomplishment.

The American newspapers eagerly printed reports of experiments in telegraphing without connecting wires, that were carried on at educational institutions with the apparatus found in the science laboratories. The successful sending of signals a distance of a few miles was considered of sufficient importance to merit headlines on the first pages of our daily papers. All this indicates that people have been much interested from the very first in the possibilities of this almost uncanny means of transmitting messages.

Less than ten years later the ship on which we crossed the ocean was equipped for sending and receiving wireless messages, a newspaper was printed each day on board giving the latest news of the world. Most of the larger passenger carrying ships were similarly equipped and many serious losses of life and property were prevented by the S. O. S., sent out by ships in distress.

In London the triple antennae suspended above the roof of the Admiralty building, the headquarters of the British Navy, and suitable equipment on the battleships made it possible for the head of the Navy department to communicate with the officers on the ships at sea hundreds of miles away.

In Paris Prof. Branley, the inventor of the coherer, the first detector used by Marconi in his earlier experiments, with considerable pardonable pride sent the patriotic message *"Vive la France"* from one room to another where it was received by an improved coherer and recorded on a tape in printed dots and dashes, when we visited him at the University of France in January 1908.

The great improvements in both sending and receiving devices during the first decade of wireless work had made it possible to send messages from Europe to America across the Atlantic ocean. Long distance stations were being constructed and much patient research work was being done to improve the sensitiveness of the receiving sets and to increase the power of the sending stations.

From this time rapid strides were made in the improving of the detector, the essential part of the receiving device. The little tube of nickel and silver filings called the coherer by its inventor had been replaced by thermal devices, electrolytic cells and many other interesting contrivances but all these were rendered obsolete by Fleming's great discovery of the vacuum valve which in its improved form, known as the audion or by other trade names, has made possible the recent great advance in the transmission and reproduction of audible sounds by the radio telephone.

It was this device used as an amplifier at the great U. S. station at Arlington near Washington, and as a detector at Honolulu 5000 miles away over land and sea, that made it possible for a person at Honolulu to recognize the person who spoke before the receiver at Arlington by the tones of his voice. This historical test of the radio telephone was made in 1915.

After this remarkable demonstration not much long distance work was attempted but all efforts were directed toward perfecting devices to use in the great world war which was now going on. We heard of radio directed torpedoes and ships steered by radio impulses, as well as many other interesting and useful applications of radio transmission.

At Rockwell field at San Diego at the close of the war the radio department of the air service occupied a large building where several officers were working out plans for using the radio telephone to communicate with a station on the earth from air planes high up among the clouds. We were much impressed when we heard the voice of one of the officers who

(Continued on Page 34)



Jerome Joseph Green was born near Somerset, Ohio, in 1865. Graduating from Ohio State University as a mechanical engineer in 1893, he studied at the University of Paris and at the Technische Hochschule, Berlin, in 1907-8. After important work in installing and testing electrical apparatus at the Chicago Exposition (1893) and at the Atlanta Exposition (1895), Mr. Green became chief instructor in the National School of Electricity, Chicago, and later (1895-1915) Professor of Physics and Engineering, University of Notre Dame. He has been head of the technical department and director of vocational education at the Junior College and High School, San Diego, California, since 1915.

Mr. Green conducted important experiments in wireless telegraphy in April, 1899, at Notre Dame, and was one of the pioneers in Radio in this country. He is a member of the San Diego Teachers' Association; A. A. A. S.; International Electrical Congress at St. Louis (1904); member of the Aerial League of America, and lecturer on aerial navigation.

Digitized by Google

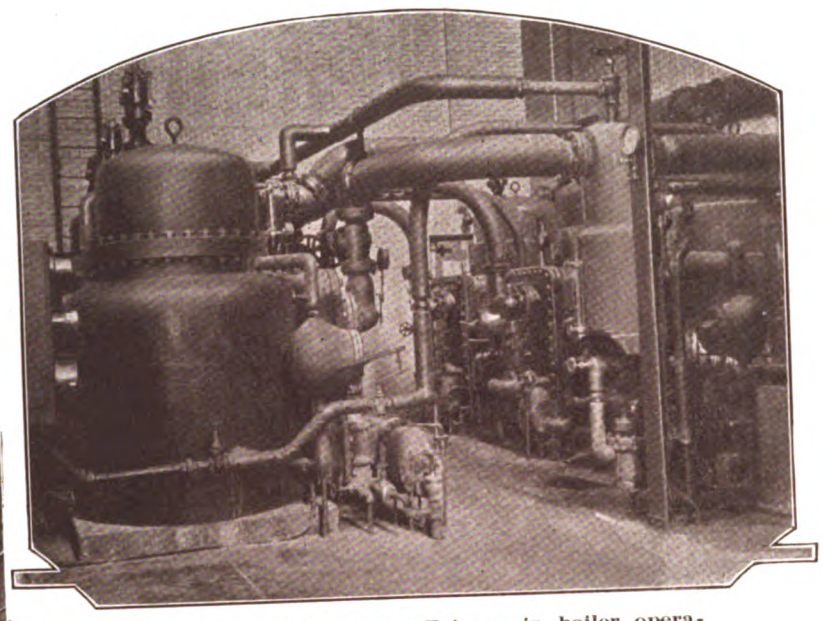
Water Problems of the Boiler Room

The Feed-Water, Exhaust Steam, Feed-Water Cycle

Below is a water softening installation serving 3300 horsepower at the plant of the Central Products Co. of Detroit. It has a capacity for softening 14,400 gallons of raw water and for heating 18,000 gallons per hour of condensed returns. These boilers operate from 200 to 250 per cent continuously and frequently at 300 per cent peaks.

H. S. B. W. Cochrane Corp., Philadelphia, Pa.





Clean boiler flues mean efficiency in boiler operation, incrustations of scale act as heat insulators and progressively decrease boiler efficiency. These incrustations are due to chemical and other impurities in the feed water. Above is shown a relatively new feed water purifying method. The evaporation by boiler steam eliminates these impurities before the feed water enters the boiler.

Griscom-Russell Co., 90 West St., New York.

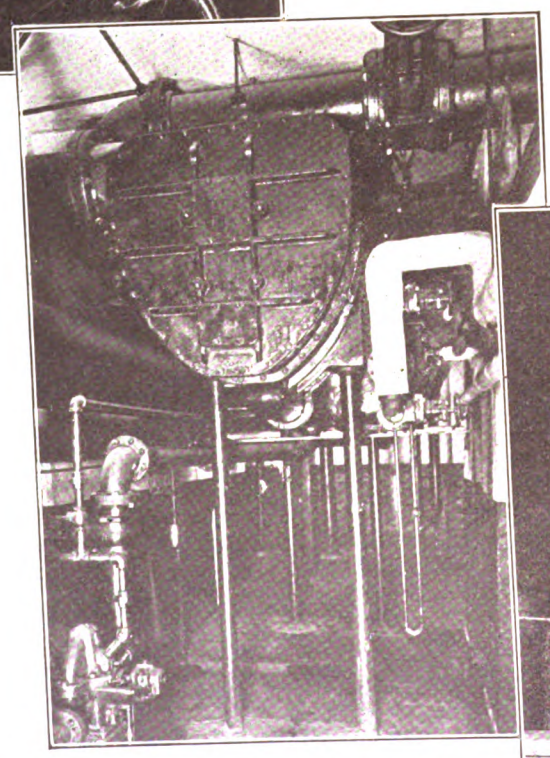
SIR ROBERT HADFIELD recently presented a paper before the Institution of Civil Engineers, in the course of which he estimated that in a single year (1020) the world lost twenty-nine million tons of steel through rust alone—$3,500,000 worth of corrosion of iron and steel in one year, without calculating the other metals! But the author admits that the major portion of this loss is impossible to prevent at the present stage of our knowledge regarding the causes and methods of preventing corrosion.

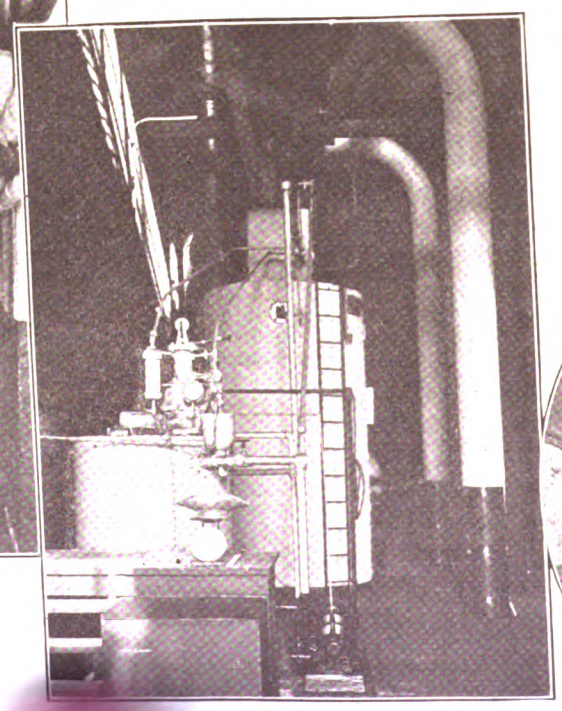
A sizeable percentage of this corrosion occurs in connection with steam power generation: in steel stacks, iron piping, and perhaps most of all in boiler shells and tubes. In the last-named case, not only corrosion, but incrustations of scale add to the difficulties: interfering with heat transmission through the tube walls and shortening the life of the tubes themselves.

Just as the chemist helped the engineer to determine the how and why of faulty draft regulation by treating combustion as a *chemical* problem, and

Louisville Light and Power Co. uses this chemical hot process softener (below) to serve their 4000-horsepower boiler plant. No tubes have been lost since the softener was put in operation, and although high ratings have been carried on the boilers there has been no forming or priming.

H. S. B. W. Cochrane Corp., Philadelphia, Pa.



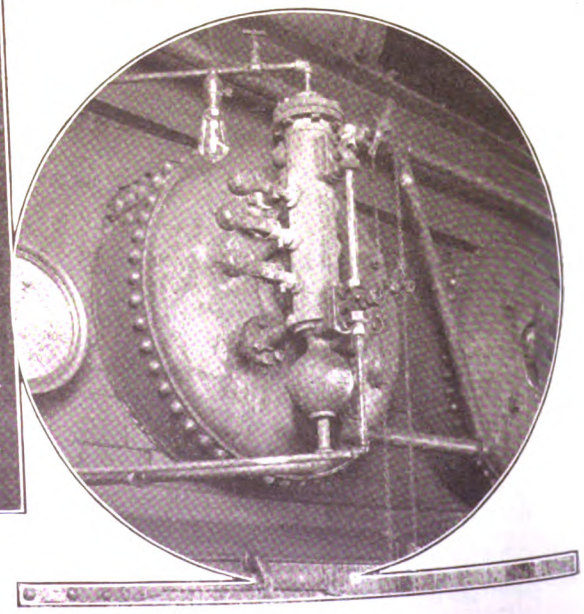


There are many styles and types of condensers for condensing exhaust steam before it is returned to the boilers. A new type is shown above installed in the power house of a large automobile plant.

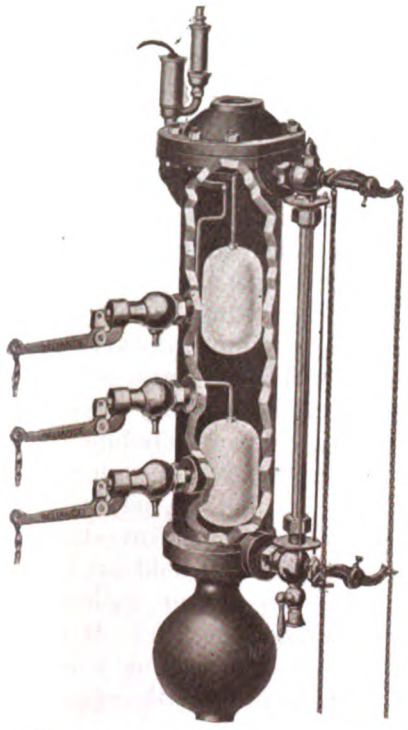
Ingersoll-Rand Co., 11 Broadway, New York.

Practically all of the new power plants have safety water columns installed from the start. Here is one, however, that has been in use for seventeen years in the power plant of the White Motor Co., Cleveland.

Reliance Gauge Column Co., Cleveland, Ohio.



Digitized by Google



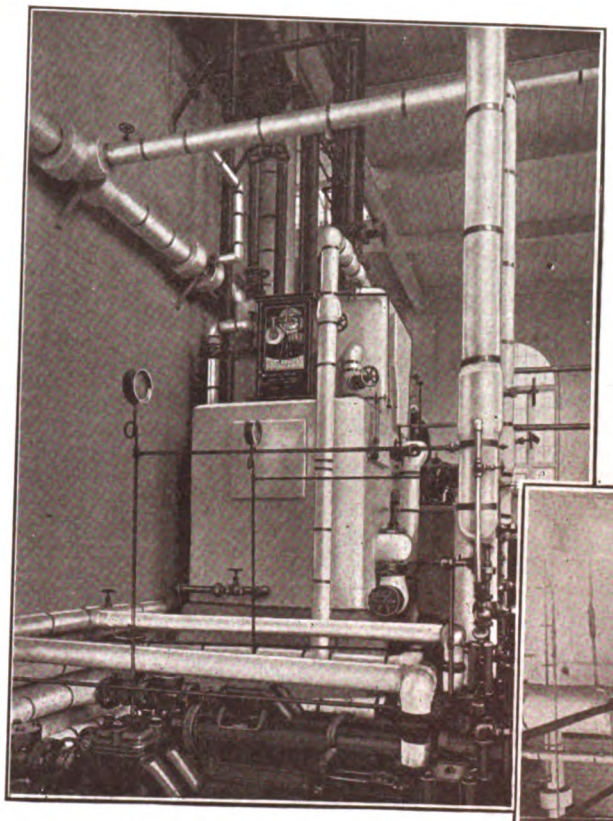
The safety water column is one of the older mechanical improvements in boiler practice, but nevertheless recognized as essential today. It eliminates the danger of explosion, warns of high as well as low level, and saves fuel by helping to maintain constant pressure. This illustration shows the "insides" of a safety water column.

Reliance Gauge Column Co., Cleveland, Ohio.

furnishing a means of determining correct flue-gas composition—so, on the problem of preventing boiler scale, again the chemist has shown his worth. But this doesn't mean that the modern power plant engineer has to master chemistry; it merely means that he must, if he is onto his job, take advantage of the work the chemists have done in showing how scale can be eliminated.

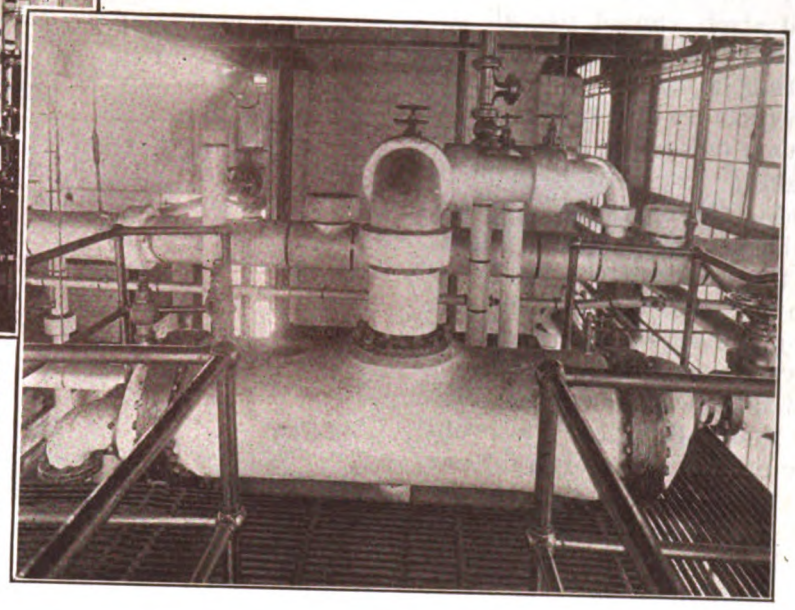
Once the water has been converted into steam in the boiler, the layman would think the proper thing to do would be to *keep* it as steam and return it to the boiler in that form to have its pressure raised. This would of course be ideal, since it would conserve all the excess heat devoted to converting water into steam in the first place. But, being a physical impossibility, it is something that practical engineers don't even dream about. Instead, since they know that only an insignificant percentage of the heat of the steam delivered to the engine is actually utilized as power—in fact, as much as 91% of this heat is discharged in the exhaust steam—they try to get as much use out of this heat as possible in the process of condensing the exhaust steam for boiler feed.

The installation at the



One way to get the most out of steam heat units after they have served for generating power, is to use the exhaust steam for heating purposes. Here is a heater which makes use of exhaust steam by transferring its heat to water circulating through the heater. This particular installation (below) is owned by the American Fabric Co., Bridgeport, Conn., and in addition to heating the plant during the cold season it also serves a group of dwellings.

Alberger Pump & Condenser Co., 140 Cedar St., N. Y.

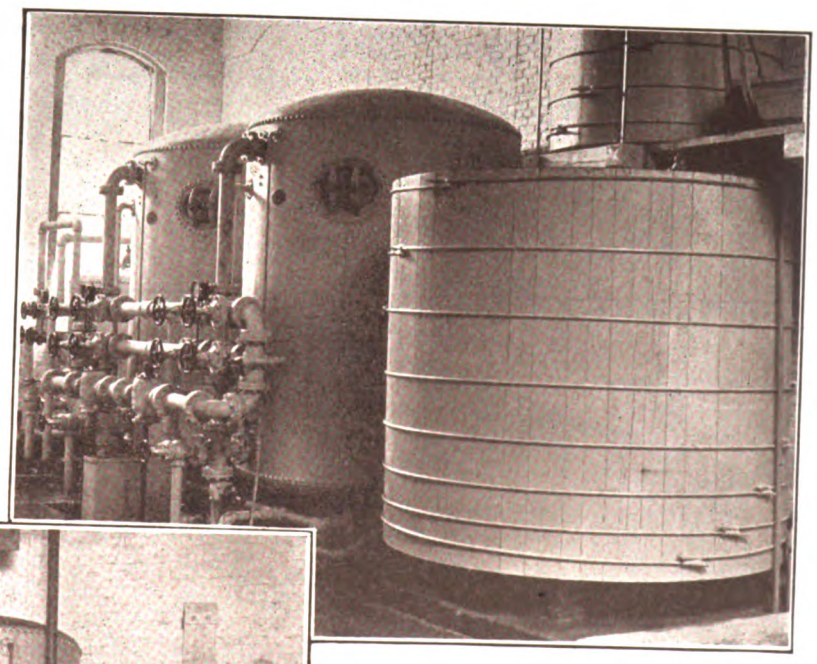


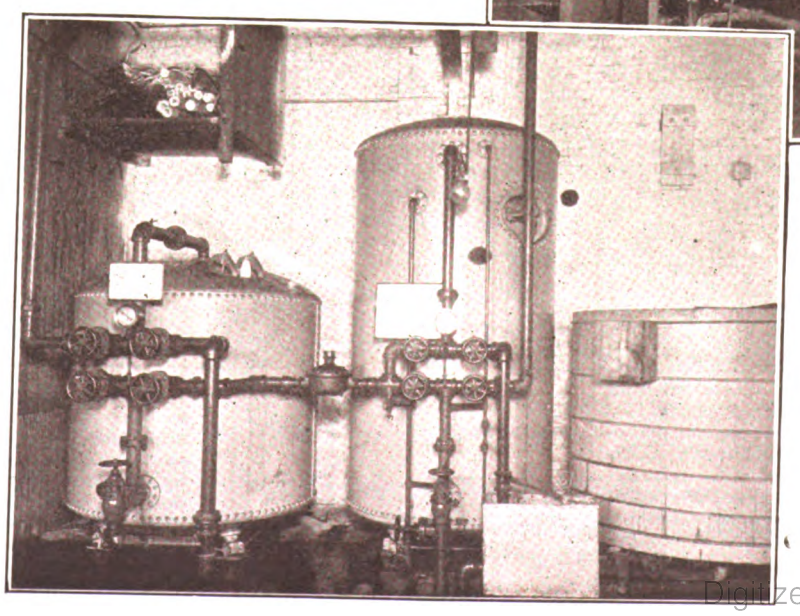
Just as necessary as measuring the coal consumption is the measurement of the feed water which gives the pounds of steam produced per hour. Here is a combination heater and feed water meter at the Duplan Silk Co., Dorranceton, Pa. This apparatus (above) utilizes exhaust steam to heat the feed water to 212 degrees, at the same time accurately measuring it.

H. S. B. W. Cochrane Corp., Philadelphia, Pa.

Here at the right are two water softeners installed in the boiler plant of a large textile mill serving 2200-horsepower. This installation is said to have saved $3600 annually for tube replacements alone in addition to other savings.

The Permutit Co., 440 Fourth Ave., New York.

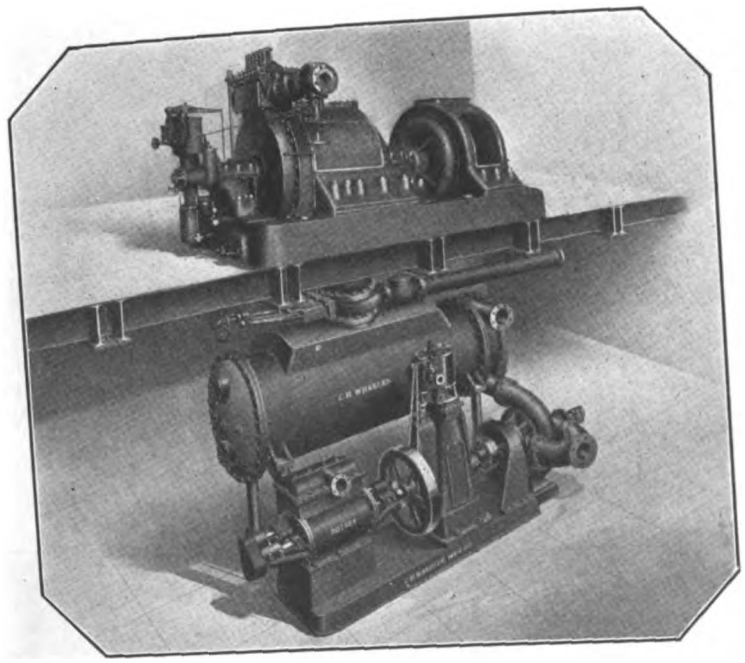




A small clarifying filter and water softener is shown at the left; installed to serve four 120-horse power returned tubular boilers. It is stated that these boilers have not had to be cleaned for the last six years.

The Permutit Co., 440 Fourth Ave., New York.

Digitized by Google



A typical modern installation showing the surface condenser connected to a steam turbo generator is shown at the right.

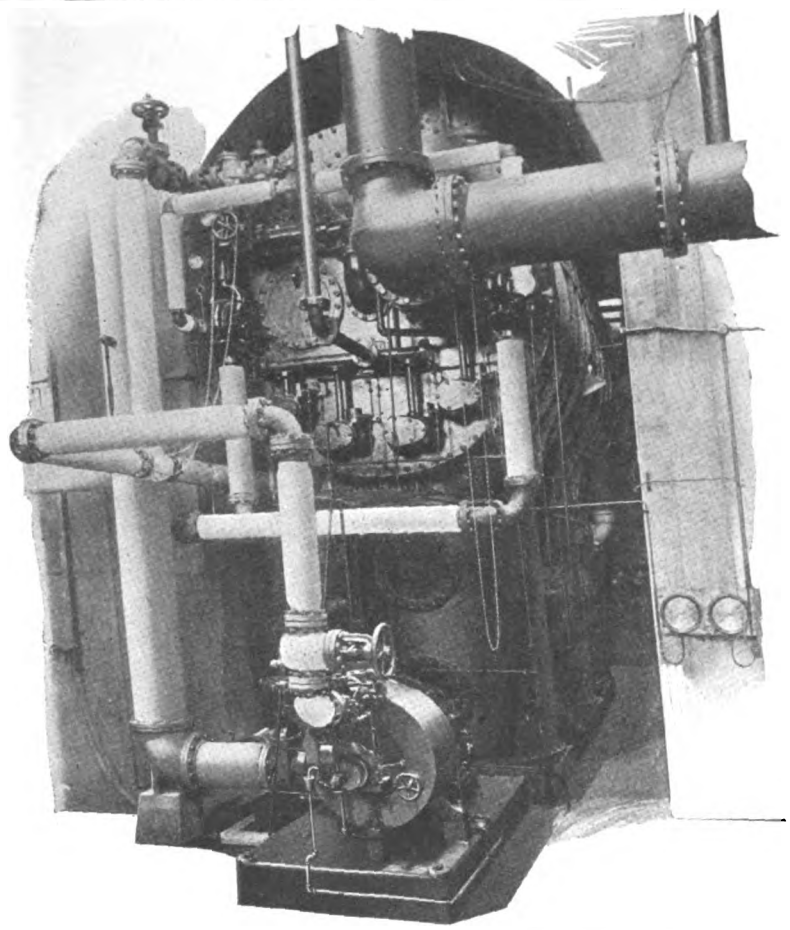
C. H. Wheeler Mfg. Co., Philadelphia, Pa.

American Fabric Company, Bridgeport, illustrated at the top of page 23, is especially interesting in connection with utilizing heat from exhaust steam, in that this heat is used both within the plant and for heating dwellings outside. In other words, just because a plant *itself* cannot use all its exhaust heat is no reason for wasting it.

In the very best operation of a steam power plant there is—speaking from an economic standpoint—an appalling waste of the heat units contained in the fuel; only fifteen to seventeen per cent of the fuel heat being converted into useful energy. Taking in all of our industrial power plants, the average thermal efficiency is probably nearer seven or eight per cent. When we realize that the *practically attainable* results are just about twice as good as the *actual average* results—or, putting it in another way, that we are paying almost twice as much as we should pay for our total steam power—it is about time we should collectively and individually do something about it.

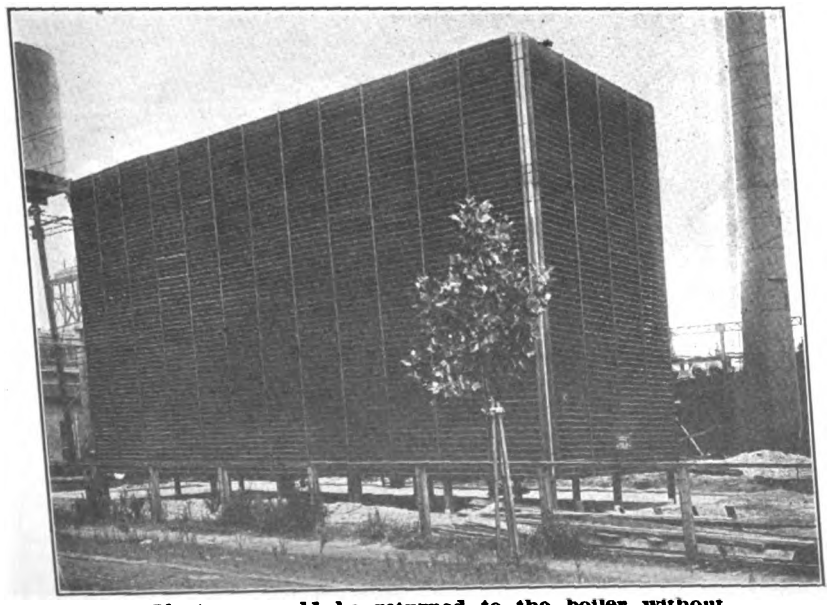
The preventable losses in steam generation are distributed among some half-dozen major classifications. It is only by going all along the line, eliminating one after the other, that the individual power plant can attain—and maintain—the efficiency it *must* have, to cope with present day fuel costs.

When your automobile was new, remember how you used to keep it oiled up, pay attention to every knock, investigate every device that held out hope of more miles per gallon or more miles per tire? It is a pity we can't assume a similar state of mind with regard to our industrial power plants. The vast majority of them as a matter of honest fact, are in much the position of an old automobile—we've become so used to the knocks and squeaks and grinds and leaky valves that it takes some great crisis to wake us up to the need for repairs and better handling. It may be that the present coal strike will, in the end, prove something of a blessing in disguise by waking us up to what we can and should do.



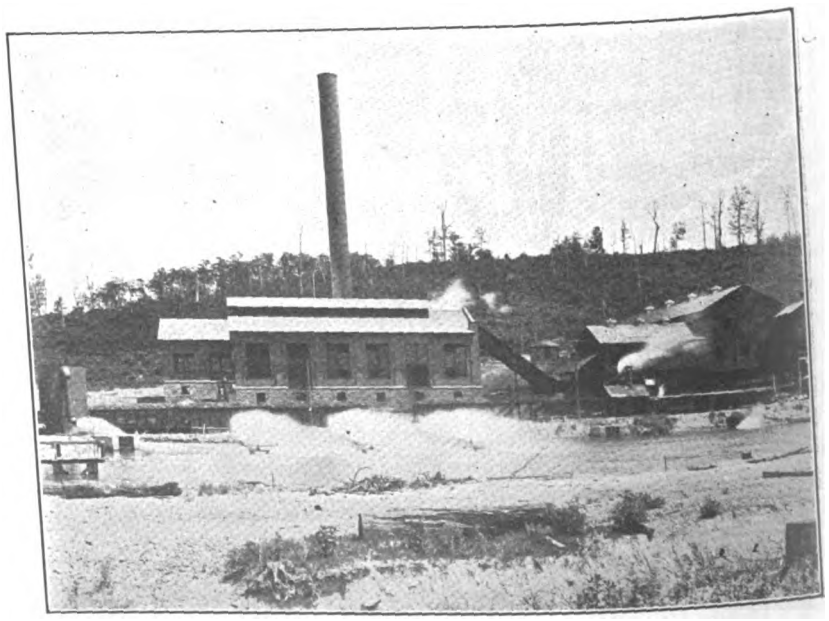
This illustrates a type of condenser known as the "jet" in which the steam gives up its heat and condenses by direct contact with the cooling water.

C. H. Wheeler Mfg. Co., Philadelphia, Pa.



If steam could be returned to the boiler without being condensed and be simply reheated and raised to a higher pressure, an age-old but impossible inventor's dream would be realized. Unfortunately steam has to be condensed into water and this requires plenty of cooling water for that purpose. A cooling tower is commonly used for this purpose when the plant is not within a reasonable distance of copious natural water supply.

C. H. Wheeler Mfg. Co., Philadelphia, Pa.



Laymen sometimes think that these attractive looking sprays are made to decorate the landscape and not for utilitarian purpose. They serve the same purpose, however, as a cooling tower although by different method. That purpose is to cool condensing water by means of contact with the air. The installation shown above is the spray pond of the Ebensburg Coal Company, Ebensburg, Pa.

Spray Engineering Co., Boston, Mass.

Digitized by Google



J. A. ZEHNTBAUER, who, in five years became President and principal stockholder in the JANTZEN KNITTING MILLS, manufacturers of the famous *Jantzen Swimming Suit,* and treasurer of another successful company.

Why wait 20 years to be a President?

HERE'S A MAN WHO WENT TO THE TOP IN FIVE

THE point which the Alexander Hamilton Institute repeats again and again is simply this: that the man who finds a way to shorten his path to success by five years, or ten years or fifteen, is actually putting into the bank from $35,000 to $75,000 or more in cash.

Succeed at fifty and you have a certain number of high-salaried years ahead of you before your work is done; succeed at thirty-five, and you have fifteen additional high-salaried years. In other words the mere money value of executive training is so great that surely you owe it to your future and your family to investigate at least.

The story of J. A. Zehntbauer is only one of thousands in the Alexander Hamilton Institute's files. As you read it go back in your business memory five years.

How does your five years' progress compare with his?

Mr. Zehntbauer was a wholesale dry goods salesman and five years ago became President of the Jantzen Knitting Mills of Portland, Oregon, a $10,000 concern. It was at that time—when he was with a little company which might either remain little, or grow great, just in proportion to the business knowledge and judgment which he was able to bring to it—that Mr. Zehntbauer enrolled for the Modern Business Course and Service.

"I wish I could write a letter which would *fully* express my admiration for the Course," he says.

"In the years following my enrolment, our company has grown from a capital of $10,000 to $250,000. During the difficult period of 1921, our plant ran day and night for six months to keep up with orders. In addition I have fathered a movement which resulted in the organization of a $300,000 company to manufacture worsted yarns, and am treasurer of that company also."

How much is 50% of $240,000?

"It would not have been possible for me by experience alone to gain in a lifetime the knowledge that I have acquired thru the Modern Business Course," Mr. Zehntbauer continues ..... "I would feel that I was making a conservative statement if I should say that at least 50% of my success could be attributed to my contact with the Alexander Hamilton Institute."

The difference between a $10,000 company and a $250,000 company is $240,000 if one considers the capital stock alone. And fifty percent of this progress, Mr. Zehntbauer says, is attributable to the fact that systematic business training made it possible for him to do in five years what other men use up a business lifetime in achieving.

"Forging Ahead in Business"

If you will clip the coupon below we shall be glad to mail you the little book which formed Mr. Zehntbauer's introduction to the Alexander Hamilton Institute—"Forging Ahead in Business." Just what the Modern Business Course and Service is and does; just how it has helped men whose position and problem were precisely like yours—all this is explained fully in this useful little book. It will be sent without obligation.

The Institute seeks to persuade no man against his will. It asks merely for an opportunity to present the facts. Surely the rewards are large enough to justify you *now* in sending for the book and giving it an hour of careful thought in your own office or home.

Alexander Hamilton Institute
557 Astor Place, New York City

Send me "FORGING AHEAD IN BUSINESS" which I may keep without obligation.

Name .....
Print here

Business Address .....

.....

Business Position .....

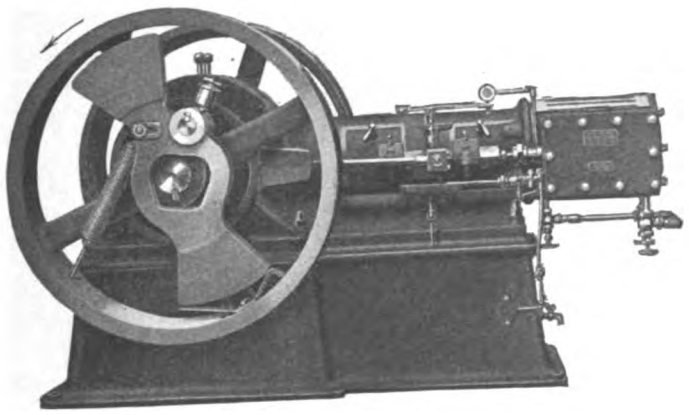
Canadian address, C.P.R. Building, Toronto; Australian address, 42 Hunter Street, Sydney

Copyright, 1922, Alexander Hamilton Institute

Digitized by Google

TROY ENGINES

ONLY STEAM ENGINES GOOD ENGINES ONLY



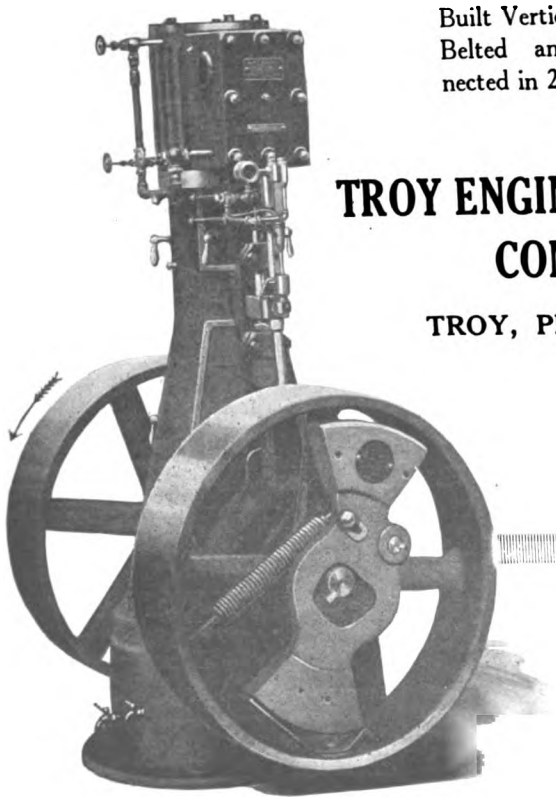
With the Automatic Oiling System

One of the reasons why Troy Engines deliver *greater brake horse power with the same steam consumption*, is the exclusive TROY System of Automatic Lubrication.

Bearings are automatically supplied with an abundance of oil. This flow of oil keeps all bearing clean and reduces wear to the minimum—thus, longer life to all parts subject to friction.

The circulation of oil starts with the starting of the engine and there are no oil cups to look after or fill frequently. The oil pump requires no priming—it starts simultaneously with the engine.

There are many other features which have been responsible for the increasing demand of TROY ENGINES as small size prime movers.



Built Vertical, Horizontal, Belted and Direct-Connected in 2 to 200 B.H.P.

TROY ENGINE & MACHINE COMPANY

TROY, PENNSYLVANIA

Send for descriptive literature

Behind the Scenes at the Chicago Board of Trade

(Continued from Page 9)

ties do. At one side, on the floor of the Exchange, are arranged tables with samples of grain actually "on track" in Chicago, graded, and classified by official grain inspection. The grain which these samples represent is sold for cash and immediate delivery, not in the "pits," but by individual selection from the samples themselves.

The other class of transaction is dealing in grain for future delivery. All of the trade in future deliveries of contract grades of grain begins and ends right in the pit. And here is the most important statement of all:—every bushel of grain which is bought or sold on the Board of Trade is actually delivered when the contract matures. Behind every sale there is somewhere a warehouse receipt which will fill it. That warehouse receipt, tendered by the buyer to a public elevator which on the face of the receipt is declared to contain the grain, will procure for the holder the exact amount of the identical grade and description called for. Of course, this warehouse receipt may pass through a score of offices, before the final day of delivery, just as a $5 bill may settle a score of debts owing by one man to another in sequence. In the eyes of the law, this changing hands of warehouse receipts constitutes delivery just as much as does the execution of a deed for real estate.

Perhaps the thing that most impresses people who visit the Board of Trade is the sign language used in buying and selling grain for future delivery. Unlike everything else seen in any other line of business this wonderful system, while simple in its execution, nevertheless puzzles the uninitiated. It is a system that has grown up with the Board, and traders would be helpless without it. In that awful din where hundreds of men and boys are rushing about and shouting, individual voices are smothered and the trader must of necessity talk with his hands.

He has no time to waste—a lost second may mean hundreds of dollars to him. The rapid fluctuation of prices makes quick action imperative, and this sign language has been developed to meet these demands. By a simple movement of his fingers the trader makes it known whether he would buy or sell, what price he is willing to pay or take, and what quantity he wishes to trade in. All the information necessary to consummate a deal, involving perhaps thousands of dollars, is conveyed by a few motions of the hand.

The sign manual of the pit trader is simplicity itself, consisting of only eight characters. The clenched fist represents the even price, say $1.25; one finger extended means one-eighth of a cent; two fingers spread apart, one-fourth of a cent, and so on up to five-eighths. When the four fingers and thumb are extended, but pressed close together, three-quarters is represented. The clenched hand with the thumb alone extended means seven-eighths of a cent.

These characters refer to the price, and the hands and fingers are held in a horizontal position. When the fingers are displayed vertically the quantity is indicated, each finger representing 5,000 bushels, up to 25,000 bushels for all four fingers and the thumb. When the desire is to sell, the palm of the hand is held outward, and when the trader wishes to buy he does his signaling with the palm of his hand facing him. An offer of a trade is either accepted by a nod of the head or refused by a wave of the hand.

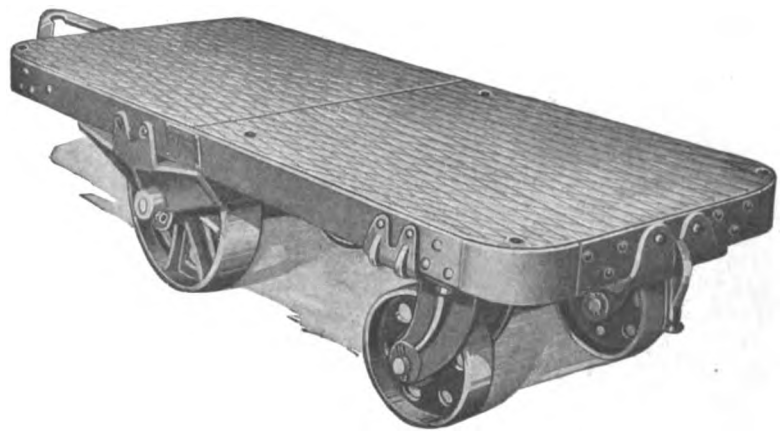
As fast as trades are made they are recorded on cards held by the two parties of the deal. These cards are printed in blue on one side and red on the other, the blue side being used for the recording of purchases, and the red for sales. On the cards are put down the amount of grain traded in, the name of the party dealt with, and the prices at which the transaction was made. Thus, if Smith buys 50,000 bushels of corn from Jones at $1.25, his card reads on the blue side, "50—Jones—1.25," while Jones enters on the red side of his card, "50—Smith—1.25." This con-

(Continued on Page 28)

Digitized by Google

Are Your Haulage Conditions "Different"?

Write for "K&J" Bulletin No. 512



"K&J" Standard 6000 lb. Trailer—Furnished with either steel or wood deck.



The "K&J" Organization has designed and built trailer and trucking equipment for many, many plants over a long period of years. The Organization is well used to meeting conditions that are "different" and to solving the problems they offer, in a highly economical way.

"K&J" Standard Types meet the conditions of a very wide variety of uses. Their adoption wherever practicable is recommended from the standpoint of greatest manufacturing economy.

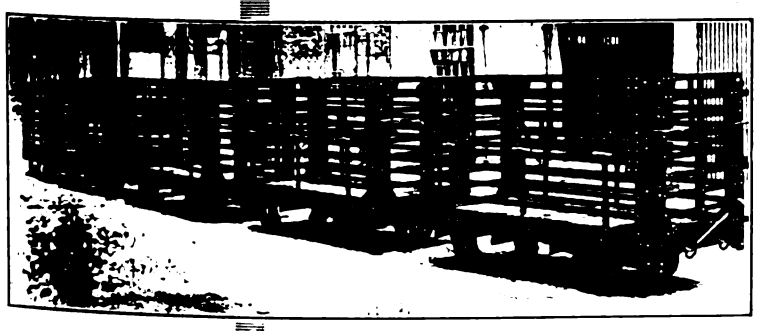
Where modifications, or entirely new designs, are clearly indicated, however, the "K&J" Organization will be the first to recognize the need and to provide designs or to build to designs submitted.



Notice carefully the rugged, simple design of "K&J" Trailers. Good trailers are really rail-less car equipment and, as such, are subject to conditions of stress, strain and impact peculiar to their class. That is why "K&J" Trailers are not built as modified hand trucks. You will be interested in the special, original features of design of "K&J" Trailer Equipment.

Hyatt Roller Bearings are standard equipment in "K&J" Standard Trailers.

Write for Bulletin No. 512.

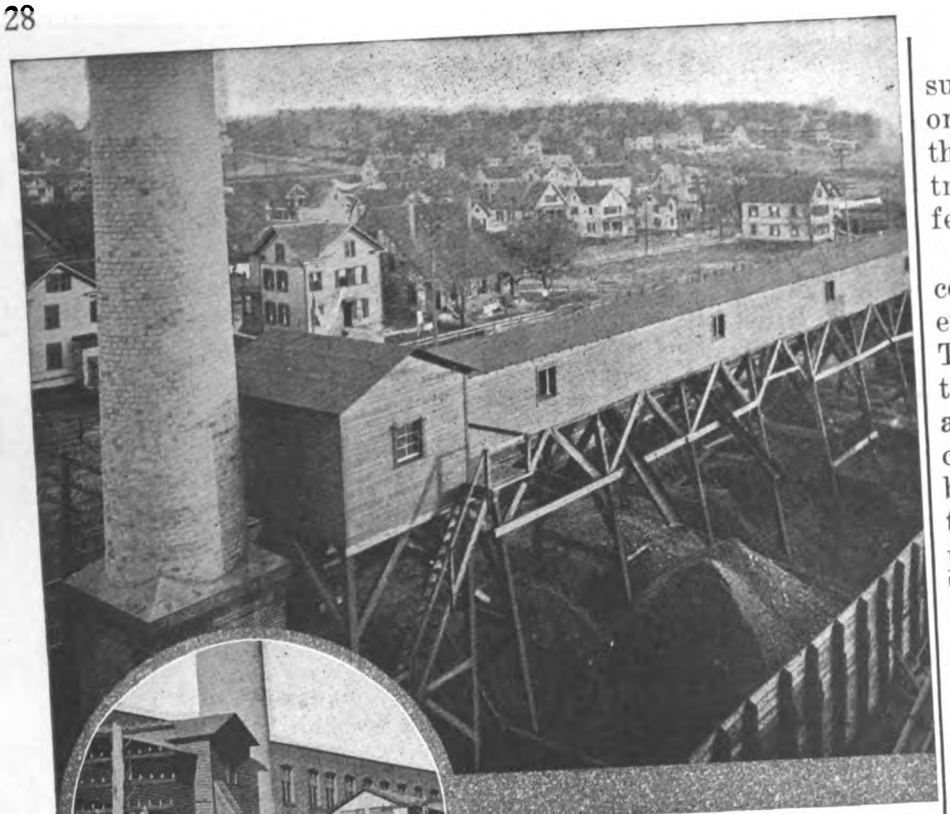




The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio, U.S.A.

New York, 120 Broadway

Digitized by Google





BUILT STRONGER LASTS LONGER

G-W Ground Storage Plant at H. L. Judd Co., Wallingford, Conn.

Assure Your Coal Supply

Strikes at the mines or on the railroads may any day reduce it to the danger point—may seriously interrupt your factory production.

Thousands of dollars in lost orders and expense incident to suspended operations are often the penalty for a depleted coal supply. Are you prepared to forestall this loss?

A Gifford-Wood Ground Storage Plant would provide you with an auxiliary, always-assured coal supply. Compared with over-head storage, its first cost is much lower and the simplicity of its construction keeps maintenance down to rock-bottom.

Would you like to talk to a Gifford-Wood representative? Or would you prefer a catalog first?

The Gifford-Wood Company specializes in elevating and conveying machinery for all lines of industry. These products include coal pockets, screens, elevators, conveyors, hoppers, locomotive coaling stations, elevating and conveying equipment for coal, ashes, stone, sand, gravel; wagon loaders, portable belt conveyors, pivoted bucket carriers, warehouse conveyors, car unloaders, friction clutches, hoists.

Main Office and Works: Hudson, N. Y.

New York Chicago Boston Buffalo

Gifford-Wood Co.

MATERIAL HANDLING EQUIPMENT

2081-R

(Continued from Page 26)

sumes but a fraction of a second of the trader's time, and thus he may make a dozen trades within the space of a few minutes.

One of the marvels of the commercial world is the system employed by the Board of Trade in sending out its quotations. Prices on the exchange are ever changing, and every change is immediately flashed broadcast over the country through the medium of the printing telegraph or ticker. The average number of quotations sent out in this way on every business day of the year is about 2,500 for all grain and provisions, the majority being on wheat. And the wonder of it all is that every one of these hundreds of quotations is available in every part of the United States and Canada, wherever a wire service is maintained, almost as soon as the price is registered in one of the pits of the Board of Trade. Yet familiar as is the sight of the ticker, with its continuous stream of figures on an unbroken line of narrow paper tape, and as simple as the process of ticking them off appears, it is really a complex and ingenious system with which few even in the grain trade are at all acquainted.

Minute after minute during the trading hours of each day prices of grain rise and fall. One instant wheat, for example, may sell at say $1.25 a bushel, the next at $1.25⅛, the next at $1.25¼, or possibly back to $1.25, or it may sell at fractions below $1.25—$1.24⅞, ¾, ⅝, and so on—the fractions always being one-eighth of a cent or a multiple of one-eighth. The total range of prices, from low to high, during a given day is determined by many factors.

Let us follow a single quotation emanating from the Board of Trade. To begin with, all commission houses doing business on the exchange have representatives or brokers in the various pits—one each for wheat, corn, oats, rye and barley, and provisions. Prior to the opening of a session, the brokers assemble in the pits awaiting the gong which announces the opening of the market. They may have any number of orders to buy and sell. During the trading hours many new orders may come in by telegraph or telephone. To meet the demands of the latter each commission house has one or more telephone operators on the trading floor of the exchange in close proximity to the pits.

We will suppose that a commission house with offices in a nearby building receives an order to buy 5,000 bushels of "May wheat" (by which is meant wheat for delivery during the month of May, even though the order is executed in March, or even an earlier month) at $1.25 per bushel. This order is immediately telephoned to the firm's telephone operator and the latter instantly rushes a written memorandum of the order to the firm's broker in the pit by messenger. If special haste is required he may flash the order to the broker by means of the trader's sign language.

The order to buy 5,000 bushels of May wheat at $1.25 having reached the broker, he proceeds to execute it by signaling his desires to some broker who is willing to sell at that price and who signifies his acceptance of the trade by a nod. The price at which the transaction was completed is noted by a trained observer, or pit reporter, on a raised platform at one edge of the pit, and here is where the transmission of the quotation over the wire starts.

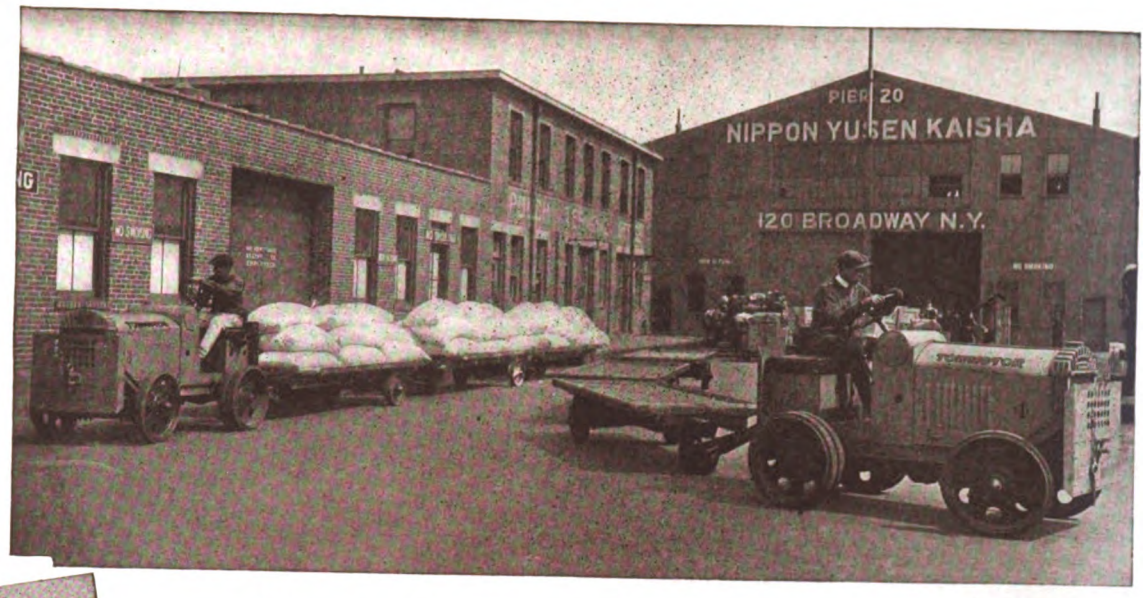
The pit reporter quickly writes the price on a slip of paper and flips it to a man at his side. The second man stamps the paper by means of a chronograph which automatically impresses upon it the day of the month, the hour, minute, and second, and passes it to a third man on another platform just above and behind him. The latter, operating a "master-key," immediately transmits the quotation by Morse code to the office of the ticker company, where a telegrapher receives it through the medium of a telegraph sounder and re-transmits it directly on the key-board of the ticker, thereby reproducing the quotation instantly on any number of tickers throughout Chicago. Through the medium of a master circuit, connected with the "master-key" already referred to, which governs six automatic repeaters and to which are attached wires covering the en-

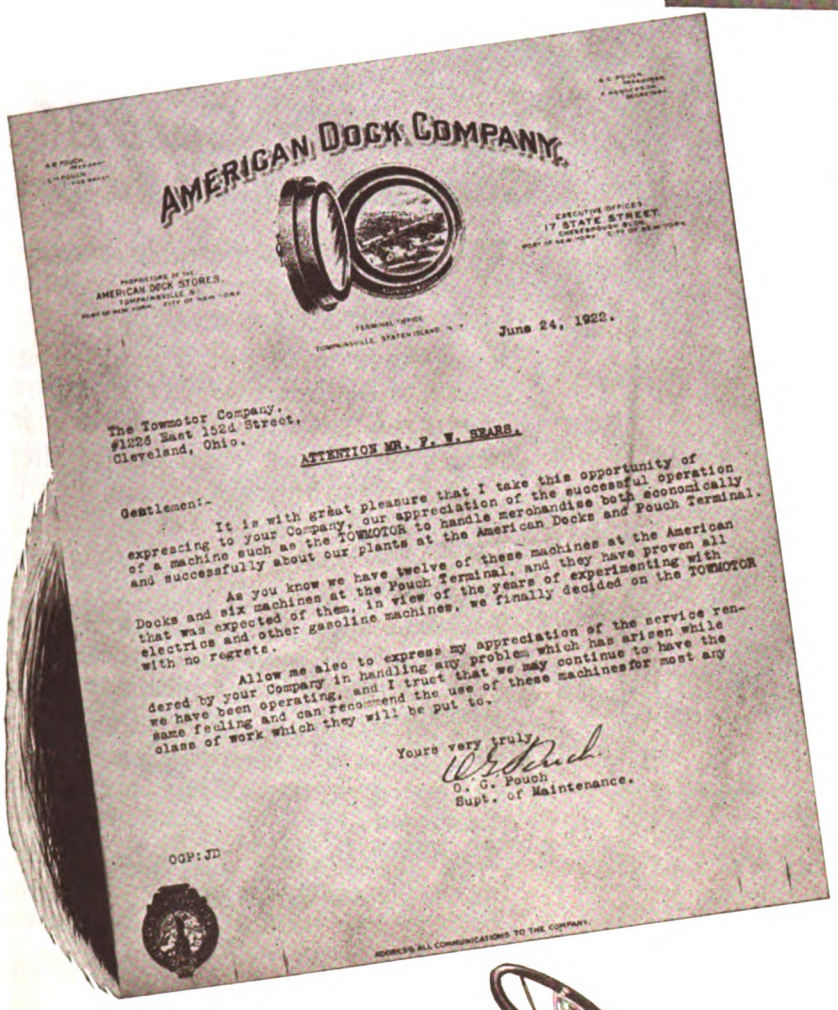
(Continued on Page 32)

Digitized by Google

Picture shows one of the piers of the American Dock and Pouch Terminals at Staten Island, N. Y., where lower costs have been made possible by a fleet of TOWMOTORS.

The effect is shown by increased business, larger buildings, etc.





AMERICAN DOCK COMPANY

June 24, 1922.

The Towmotor Company,
#1226 East 152d Street,
Cleveland, Ohio.

ATTENTION MR. F. W. SEARS.

Gentlemen:-

It is with great pleasure that I take this opportunity of expressing to your Company, our appreciation of the successful operation of a machine such as the TOWMOTOR to handle merchandise both economically and successfully about our plants at the American Docks and Pouch Terminal.

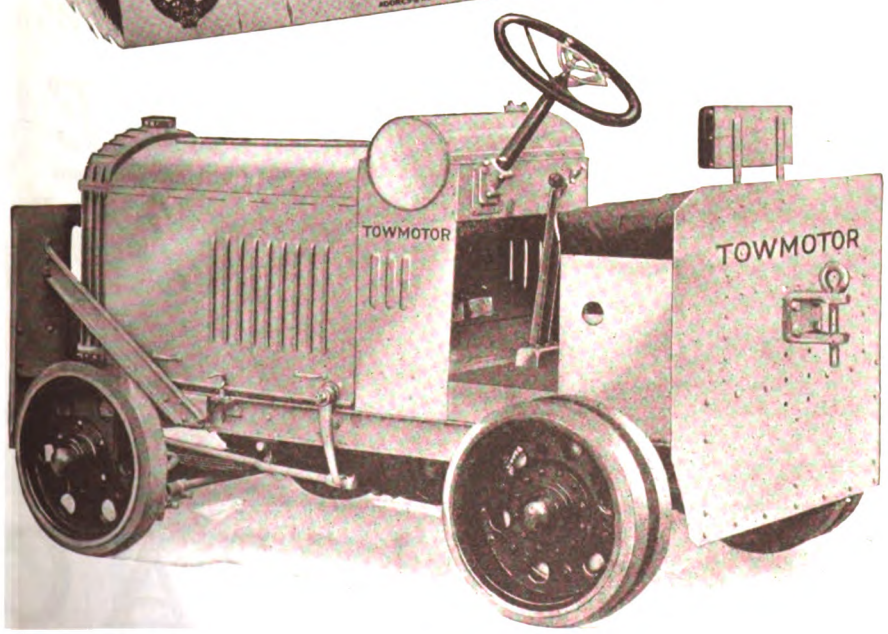
As you know we have twelve of these machines at the American Docks and six machines at the Pouch Terminal, and they have proven all that was expected of them, in view of the years of experimenting with electrics and other gasoline machines, we finally decided on the TOWMOTOR with no regrets.

Allow me also to express my appreciation of the service rendered by your Company in handling any problem which has arisen while we have been operating, and I trust that we may continue to have the same feeling and can recommend the use of these machines for most any class of work which they will be put to.

Yours very truly,
O. C. Pouch
Supt. of Maintenance.

OCP:JD

ADDRESS ALL COMMUNICATIONS TO THE COMPANY.



Loading the Ships that Sail the "Seven Seas"

AT the American Dock and Pouch Terminals in New York Harbor, a fleet of eighteen TOWMOTORS are cutting labor costs and saving time in transporting freight between warehouse and ship hold.

The TOWMOTOR is always ready for duty. No load is too heavy to haul. A single TOWMOTOR will pull a train of trailers loaded with 30,000 lbs. of merchandise. And that is a common occurrence at these docks.

For Railway, Dock and Terminal Warehouse Haulage the TOWMOTOR is especially valuable. It will handle trailers singly and in trains—haul heavy machinery on skids—push or pull heavy packages and spot freight cars if necessary. Its flexibility is unsurpassed. It has sufficient capacity to move freight cars and still operate economically on light loads.

The TOWMOTOR is not a *remodelled automobile.* It is an *industrial tractor* driven by a gasoline engine *designed* and *built* especially for *industrial haulage.*

Ask any user how the TOWMOTOR will cut down your haulage costs and eliminate waste time and labor, or write to us for descriptive literature.

THE TOWMOTOR COMPANY

1226 East 152nd Street

CLEVELAND, OHIO

THE TOWMOTOR

Digitized by Google

MORE TONS P



ABOVE—Loading coal into truck at the Campbell Morrell Co., Passaic, N. J. Note ease of feeding.



ABOVE—The flexibility and economical operation of these machines at the Gera Mills, Garfield, N. J., enable them to save a large amount of money in unloading their coal from cars to storage and then reclaiming to boiler room.

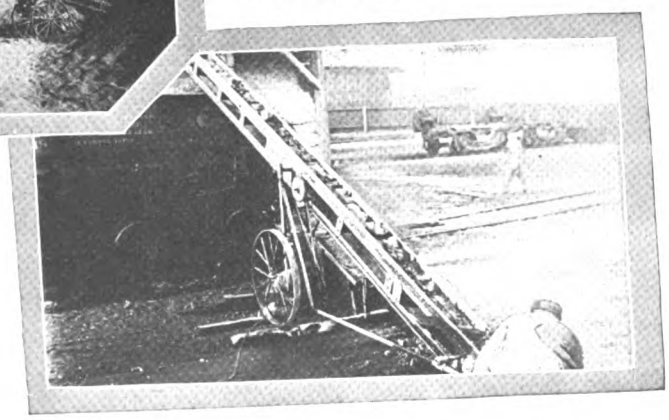


ABOVE—The Scoop Conveyor loading an electrical truck trailor for delivery to boiler room. This is an ideal installation where coal is received at a distance from the boiler room.



ABOVE—Two Scoop Conveyors in tandem style reclaiming coal direct from storage pile to boiler room at the Standard Oil Cloth Co., Athenia, N. J.

BELOW—Loading cars at the Carnegie Steel Co., Mingo Junction, Ohio.



ask any

Operating Cost of New Mod
Guaranteed Not to Exceed One Ce

WAS ever a portable conveyor so amazingly economical as this New Scoop Conveyor?

Ever since its debut 6 months ago the conveyor has been subject to an ovation in which Europe and America have joined.

Now, with more than 500 of the New Models in the hands of owners, the advance favor and faith in the Scoop Conveyor is repaid, we believe, by the reliability record it has established.

As owners of preceding models heartily testify, the Scoop Conveyor has always been singularly economical to operate.

But reports from owners show that new models are operated for less than half of the operating cost of any previous Scoop Conveyor.

Even this pointed tribute to the new model's economy is overshadowed by the positive expressions of praise from owners,

Write for C

THE S CONV

PORTABLE MACH
PASSAIC,

Digitized by Google

PER DOLLAR

ay user

Model Scoop Conveyor
One Cent Per Ton Handled

many of whom have handled large tonnage under all conditions.

In numerous instances owners of the new model report that their conveyors have required no expenditure whatever except for power and lubrication.

They pay glowing compliments also to the increased power, the greater capacity and the real portability of the new model Scoop Conveyor as well as to its dependability and wide adaptability.

But the one fact upon which all seize and ardently emphasize and recur to again and again is the new Scoop Conveyor's amazing economy which they insist has never been equalled or approached before, even by the fine Scoop Conveyor forerunners.

In fact, owners of the conveyors are unanimous in proclaiming the 1922 Model the greatest Scoop Conveyor ever produced.

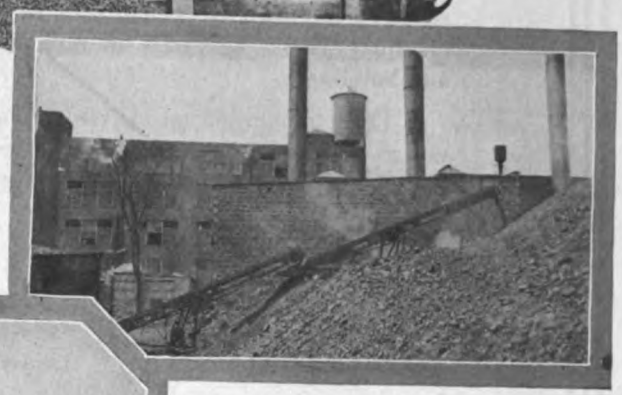
What bears them out in this verdict and establishes completely the New Model's preeminence is the fact that orders have come in so fast that all former production schedules have been exceeded.

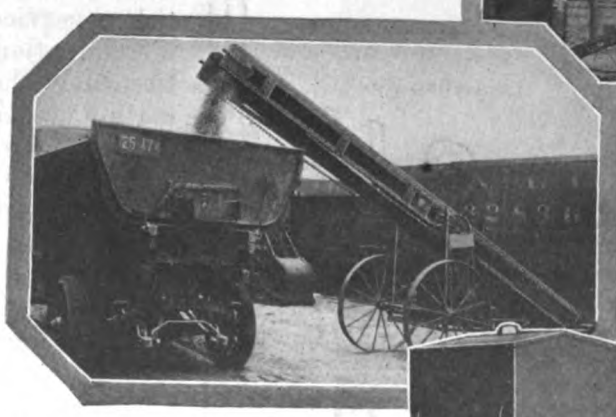
alog No. 63

COOP
EYOR



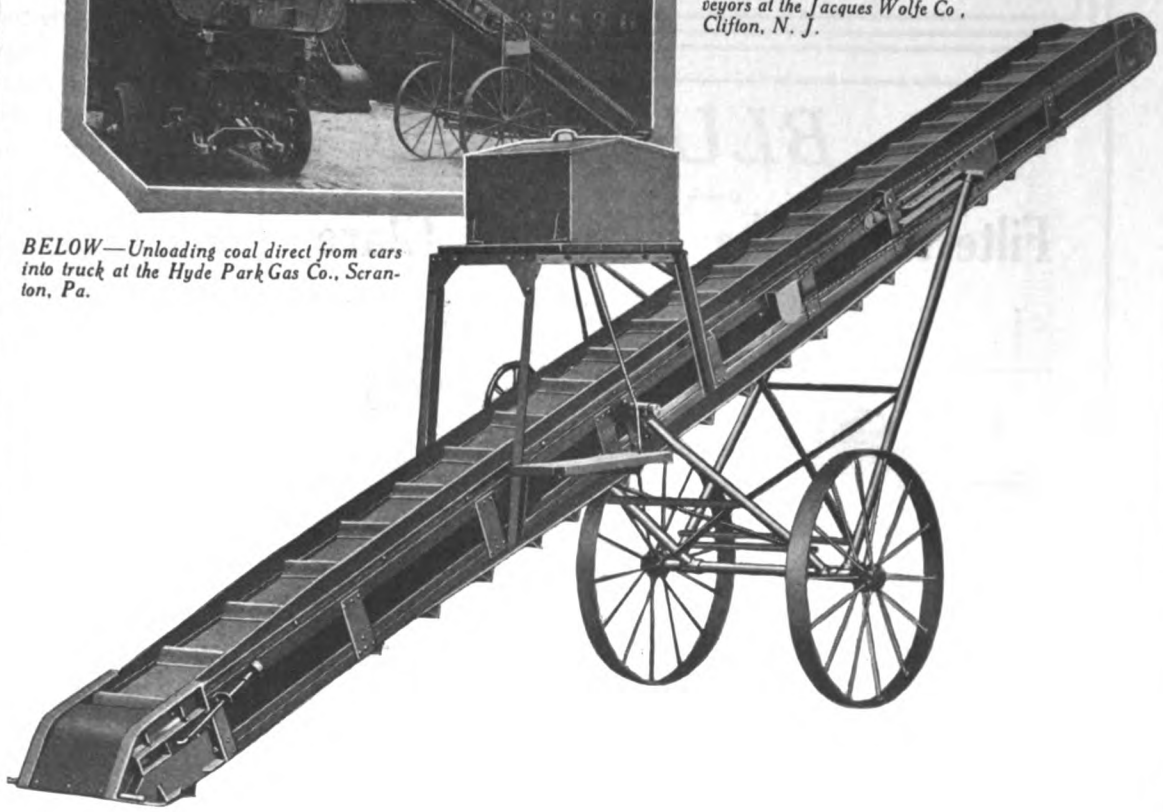
ABOVE—Unloading 50 ton cars in three hours at the Carey Salt Co., Hutchinson, Kansas.





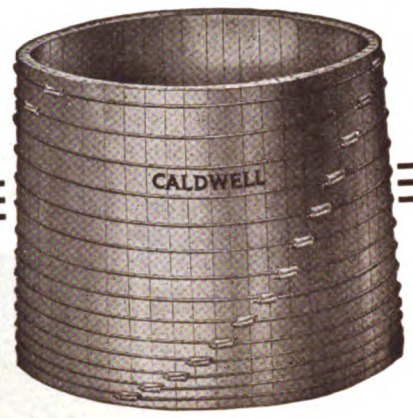
ABOVE—Unloading and Storing Coal with two Scoop Conveyors at the Jacques Wolfe Co., Clifton, N. J.

BELOW—Unloading coal direct from cars into truck at the Hyde Park Gas Co., Scranton, Pa.



INERY COMPANY
EW JERSEY

Digitized by Google



We Grow These Tanks!

To make sure of the quality of the cypress that goes into "The Tank with a Reputation" we use wood from our own trees, cut in our own sawmills, finished in our own shops by our own workmen with the benefit of thirty years experience in tank designing and building.

The combination means real economy to you in cost and in long, faithful service. Get the Caldwell story the next time you are thinking of tanks.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook St. Louisville, Ky.

Caldwell TANKS AND TOWERS

BLU-EE

TRADE MARK

Filters out the Heat and Glare



BLU-EE (Blue-ease) is all that the name implies. Its blue color filters out the rays of the glaring sun allowing only those rays to penetrate that ease the workers' eyes. It cuts the glare and heat—it gives them a chance to do their best.

And it is easy to apply. Simply dissolve in hot water and paint on windows with an ordinary brush. One coat lasts for months. BLU-EE will not rub off. It will stand thorough dusting and even vigorous rubbing with a dry cloth. Easily removed with hot water.

Try some in your plant. You can do so at our risk. Sign the coupon below and mail it in at once.

PARK CHEMICAL COMPANY
3822 Edwards Road Cincinnati, Ohio

Try It Out—We Run the Risk

PLEASE send me 2 packages of Blu-EE, sufficient to cover 2000 square feet of glass. It is understood that I am to use one of the packages as directed and will remit $5.00 for both if I am satisfied with Blu-EE, and if not entirely satisfied may return the other within sixty days and you will cancel this order.

Firm Name..... Position.....

Your Name..... Address.....

(Continued from Page 28)

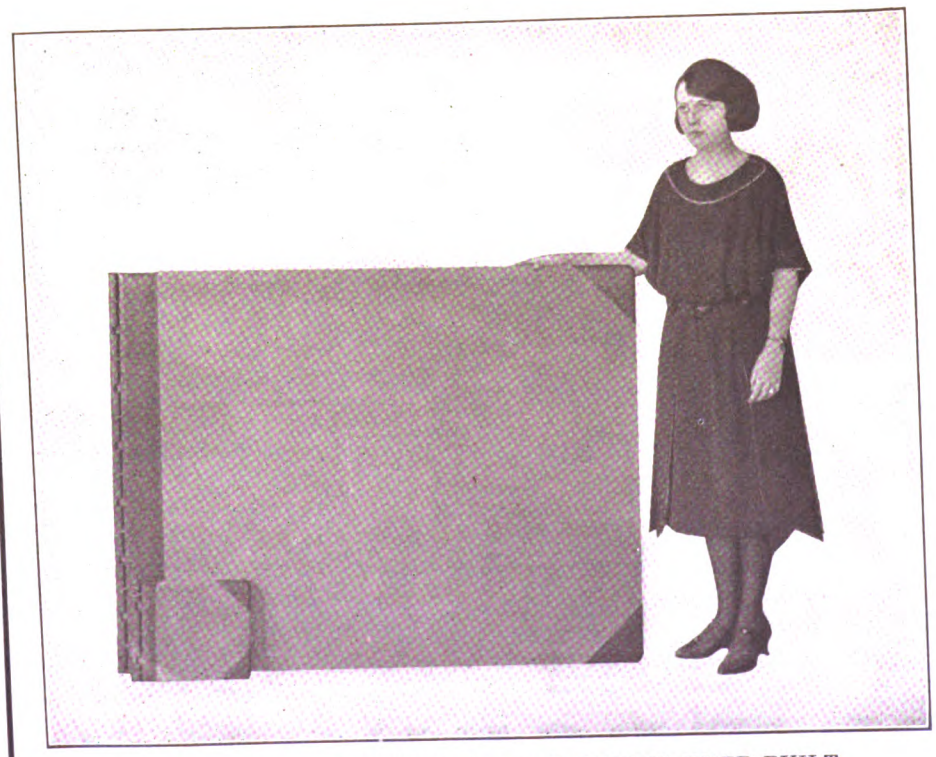
tire United States and Canada, the quotation is also received simultaneously by all points in these two countries which subscribe to the service.

While all this sounds more or less complicated, the system has been worked out to such perfection that the average time consumed in transmitting a quotation, from the moment a trade is made in the pit of the Board of Trade until the price at which it was made appears on the ticker, is only 3 3/5 seconds. The fastest time made is 1 2/5 seconds, and the greatest number of quotations ever transmitted in this manner was on August 14, 1914, when an average of 42 2/9 per minute was maintained for 102 consecutive minutes.

In addition to transmitting its quotations to every part of the country in the manner described, the Board of Trade also makes use of a special ticker service devoted to the dissemination of news, statistics, and other valuable information. This information is distributed over the so-called "Broad-tape ticker," an electrically operated instrument which is an important factor in the marketing of grain and provisions. The transmitter of this device consists of mechanism with a key-board like that of a type-writer and in operation works on the same principle as the key-board of the quotation ticker.

The tickers receiving this service, which are located in practically all commission houses and on the exchange floor, are connected by wire to the transmitter and print instantly, on a roll of tape about six inches wide, all news that is transmitted by the operator. Market news and quotations from all foreign countries as well as domestic markets are gathered and distributed over these tickers. The trader watches the news tickers very closely and is posted up to the minute on all important developments and general price exchanges in the markets of the world.

The elaborate collection of trade information furnished by the Board of Trade is given the widest possible circulation and is really for the benefit of the general public as much as for members of the exchange. Every effort is made to facilitate the prompt diffusion of the facts obtained, and this information, with absolutely no restrictions, is sent broadcast for the benefit of producer and consumer, buyer and seller, alike.

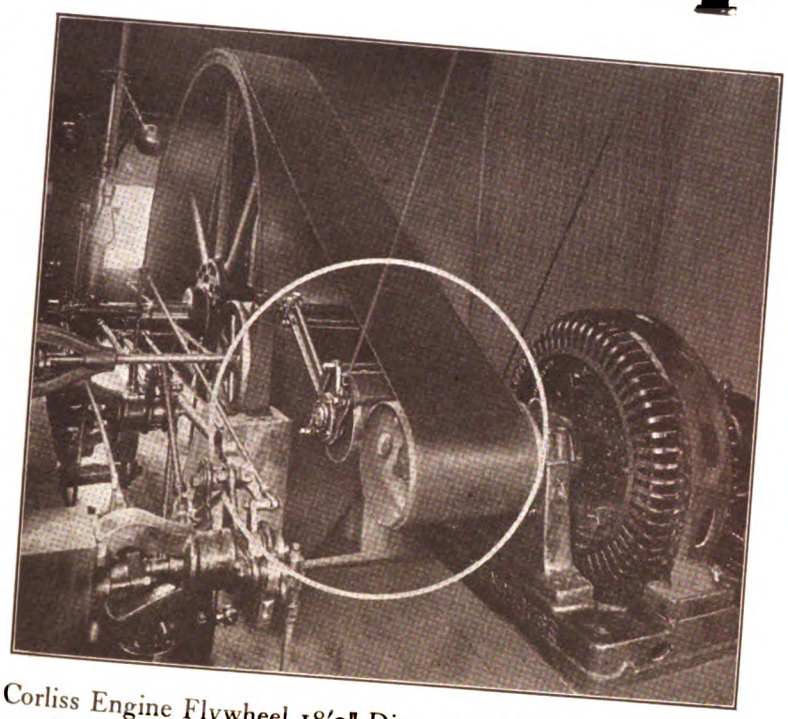


THIS IS THE LARGEST LOOSE LEAF BINDER EVER BUILT.

Made by the Kalamazoo Loose Leaf Binder Co., Kalamazoo, Michigan, for the John Hancock Insurance Company, Dallas, Texas. Weight—100 lbs., empty; with sheets—500 lbs. Size—41½ x 54 inches—9 feet wide when open. Holds eleven inches of sheets. The small binder shown is the usual commercial size.

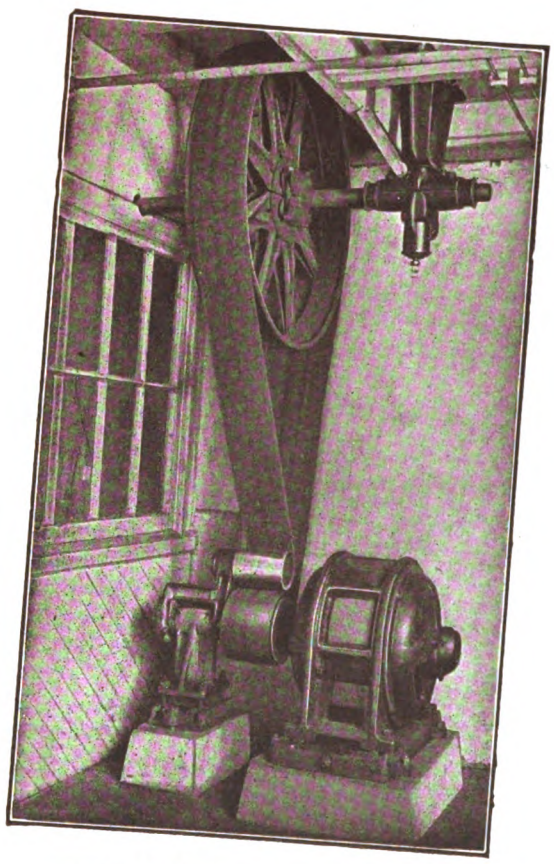
Digitized by Google

The Korap*Lenix Drive

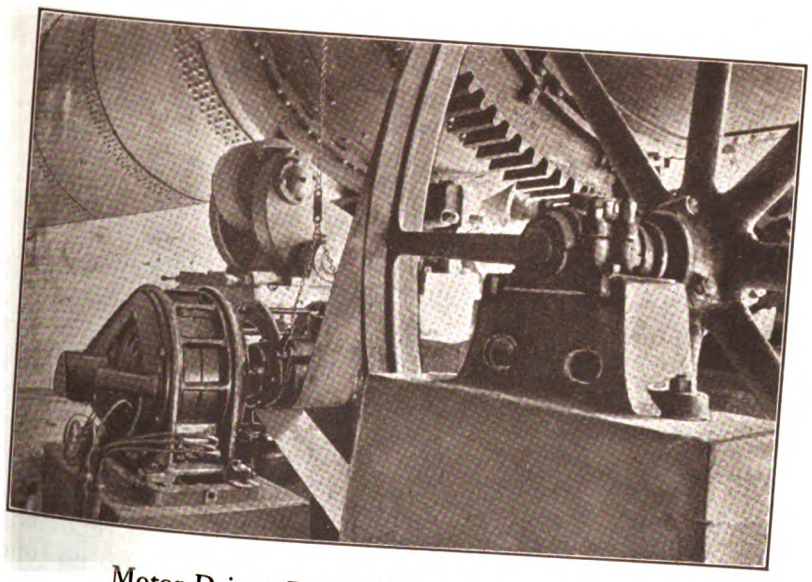


Corliss Engine Flywheel 18'0" Dia., 30½" Face, 61 R. P. M.
200 K W Generator Pulley 22½" Dia., 30" Face, 600 R.P.M.
Pulley Centers 16' 0"
Pulley Ratio about 1:10
Medium thick, double leather belt 28" wide

Not unusual applications, merely typical of the many thousands of KORAP-LENIXES installed on drives ranging from 3 HP to 1400 HP.



30 HP Motor Driven Lineshaft
Lineshaft Pulley 44" Dia., 9" Face, 156 R.P.M.
Motor Pulley 9" Dia., 9" Face, 720 R.P.M.
Double Leather Belt 8" Wide, 9/32" Thick



Motor Driven Rotary Kiln in Cement Plant
Kiln Pulley 10'0" Dia., 10" Face
Motor Pulley 12" Dia., 12" Face
Pulley Centers 8'0"
Pulley Ratio 1:10
Double leather belt 10" wide, 9/32" thick

Booklet

"SAVING SLIPPAGE AND SPACE" describes other interesting KORAP-LENIX installations. Write for a copy.

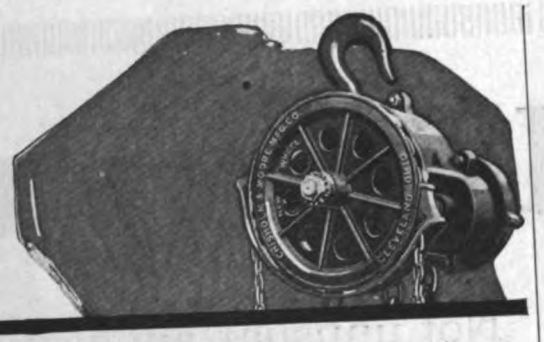
F. L. Smidth & Co.

ENGINEERS

50 Church Street — New York, N. Y.

*Improved LENIX Drive

Digitized by Google

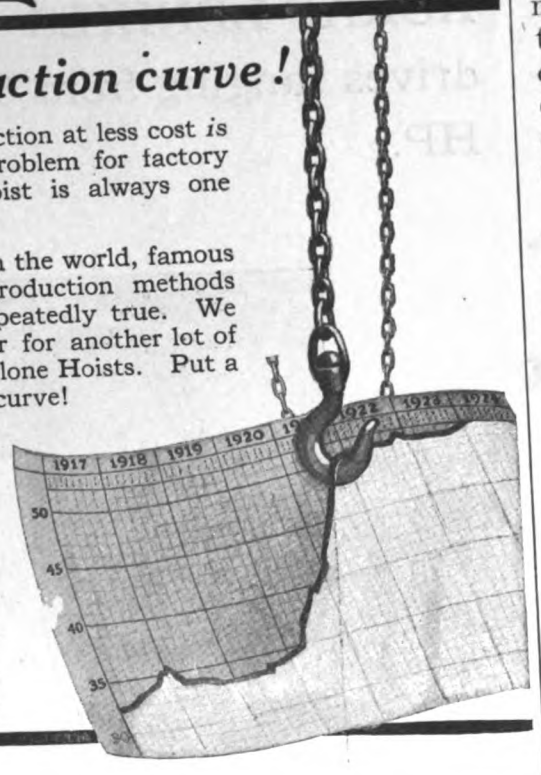


CYCLONE HIGH SPEED HOISTS

—lift your production curve!

FASTER, smoother production at less cost *is and always will be* a problem for factory management. A Cyclone Hoist is always one sure means toward that end!

One of the largest factories in the world, famous for the wonderful, efficient production methods developed, has found this repeatedly true. We have just received their order for another lot of more than two hundred Cyclone Hoists. Put a Cyclone on *your* production curve!



Catalog sent on request. We have capable distributors in all localities to aid you in layout of material-handling and hoisting systems and submit estimates. Write.

The Chisholm-Moore Mfg. Co.
CLEVELAND, O.
Hoists : Cranes : Trolleys
Branches:
New York—Chicago—Pittsburgh

MORRiS PUMPS

One of the 65 Thousand

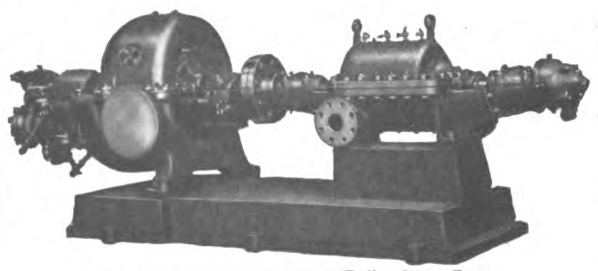
In the past 58 years we have built over 65 thousand Centrifugal Pumps of all types and sizes.

The Centrifugal Turbine Driven Boiler Feed Pump shown below, is characteristic of the type of Morris Pumps that are rendering efficient, reliable service, with the utmost economy in power plants everywhere.

The small space occupied, light weight and minimum attention required, make them far superior to reciprocating pumps for boiler feed service.

Learn details why Morris Pumps have kept the lead for 58 years, through our bulletins

Since 1864
Builders of
Dredges, Centrifugal Pumps and
Steam Engines



Centrifugal Turbine Driven Boiler Feed Pump

MORRIS MACHINE WORKS
200 Genesee St., Baldwinsville, NEW YORK

Pioneer Work in Developing the Radio Telephone

(Continued from Page 21)

went up a mile or more and talked to us making use of one of their latest compact sending sets installed on a training plane. A large stock of vacuum tube detectors, tuning coils and assembled sets were ready for use. This indicates that much had been done by the military people during the war to develop radio telephony but orders came soon after this to discontinue the work on account of lack of funds.

For some time after the war there was no organized effort to develop radio work. The amateur stations had been closed during the time we were at war and they gradually renewed their activity under strict regulation.

During the last two or three years, however, there have been installed at many places in our country high powered private sending stations that began to send out music, singing and reading of news items to all who cared to tune in to their wave length.

To-day the newspapers keep us informed of the latest developments in broadcasting and they print the programs which include everything from jazz tunes from a phonograph to the splendid voice of an opera singer and from a husky voiced advertiser of a new brand of soap to a lecture on psychology by a prominent college professor.

Our prediction many years ago that at some future time it would be possible for us to hear the news of the hour in spoken words at our breakfast table instead of reading it after it was several hours old in the morning paper is now practically being realized through the service rendered by the numerous broadcasting stations all over the United States.

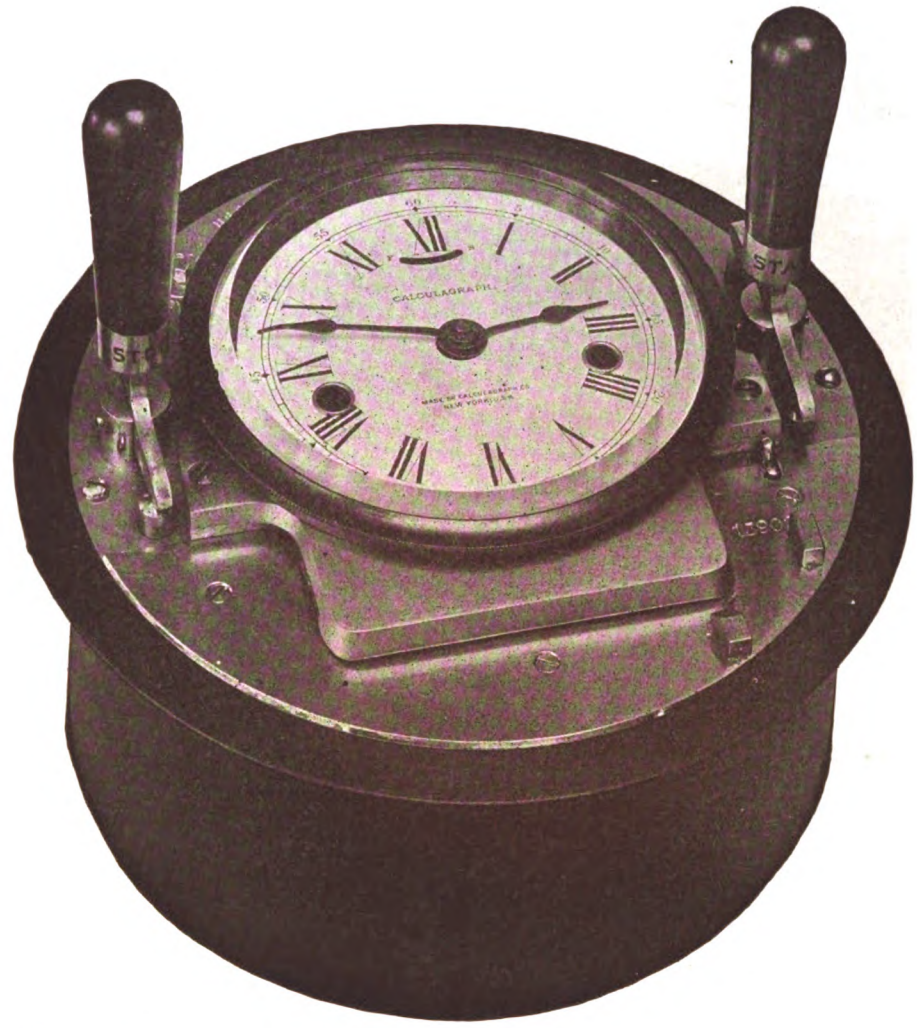
It is probable that history will repeat itself in regard to the radio telephone. It will not supersede nor displace the older forms of wire transmission but will occupy a new field unique in many ways. A comparatively inexpensive receiving set enables anyone at no additional expense to remain comfortable at home and hear good music, speeches, sermons, lectures and a choice of other interesting programs sent out at prearranged times from convenient central locations.

All this seems to indicate that radio news and radio music and radio lectures will not displace our present arrangement in regard to these matters. The telephone did not displace the telegraph but supplemented it as a means of rapid communication over great distances. The telegraph systems continued to grow and increase in usefulness but the newer telephone soon reached a position of enormous importance in our social and economic life. Vast sums of money were expended in building equipment, lines, etc., and thousands of skilled mechanics and electrical experts have been constantly employed in the manufacture, installation, and operation of telephone apparatus.

Judging from the great demand for radio receiving sets today, a great manufacturing industry will spring up to supply this demand. Many experts will be required to install and operate the somewhat complicated apparatus at the highly powered broadcasting stations. There will be a new demand for power to operate these high powered stations requiring additions to generating and distributing and regulating systems of electrical energy and if the rapid rise of the telephone to a place of importance is an indication, we may expect that another decade will find a need for thousands of radio experts engaged in a new branch of electrical engineering, and if the advances made in the recent years are repeated in the years to come no one may safely say now what the future may bring. It is not beyond the range of possibility that a small pocket set will be developed that will enable the farmer to keep in touch with the good things of music and literature and art while he drives the cultivator over the field, the sailor can hear the sounds from the busy city while he speeds over the lonesome stretches of distant seas. The ambitious boy may get special lectures on subjects he is taking in school between his home study periods in the long even-

(Continued on Page 36)

Digitized by Google



Mechanical Equipment Must Be Mechanically Right—

In a time recording machine, more than in almost any other piece of mechanical equipment, the machine must be accurate, durable and reliable—mechanically right.

During the past 28 years the Calculagraph has been working daily in thousands of machine shops, manufacturing plants, power houses, garages, billiard parlors, telephone switchboards, etc. It has been recommended and re-ordered by its users, because it has given REAL service. It is mechanically right.

There is no jumping and locking of the mechanism in the Calculagraph such as is found in electrically operated time clocks. The Calculagraph has a spring-driven, eight-day movement with jeweled balances. Its ribbon is easily inserted and automatically reverses itself. The cards for use in it can be of various sizes and shapes and can be furnished by your own printer.

The Calculagraph record cannot be faked. The imprints are made from metal type which rotate continuously. Setting the hands on the clock face will not in any way change the elapsed time record.

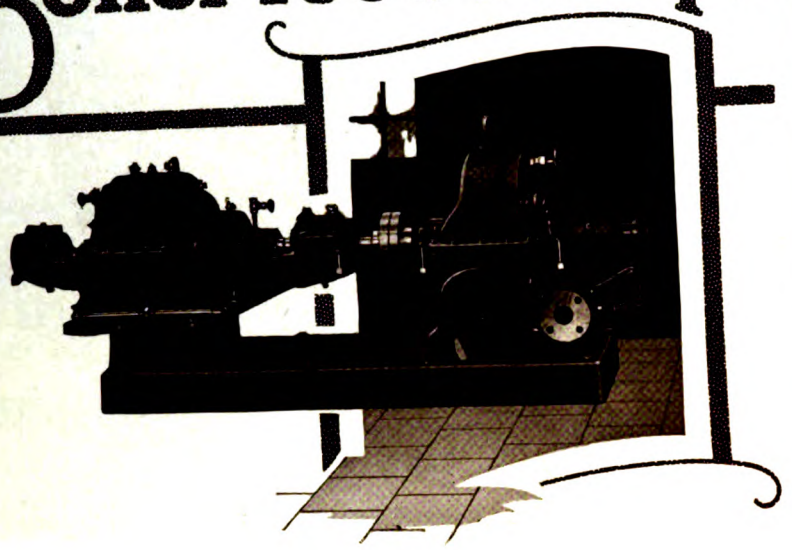
Let us send you a copy of —*"Elapsed Time Records"*— which tells the complete story of this durable time clock, so simple to install and operate.

THE CALCULAGRAPH
THE ELAPSED TIME RECORDER

34 Church Street **New York City**

Digitized by Google

Boiler Feed Pumps



IN plants of 1000 H. P. or over the centrifugal boiler feed unit has proved superior to any other type. It occupies less space, it requires but little attention its even flow of water prevents water-hammer with the attendant piping and valve repair costs. The Terry turbine for boiler feed service is easily adaptable to automatic control which will maintain either constant pressure in the boiler feed line or a definite excess pressure regardless of the quantity of feed water being pumped. The mechanism employed to accomplish this is mounted directly on the turbine and actuates the turbine governor valve. Of the 8,000 or more Terry turbines now installed, 2500 are used for driving boiler feed pumps. The features of construction that have made the Terry turbine so popular for this class of service are explained in Bulletin Z-25. Write for it.

T-774

THE TERRY TURBINE

Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries



The Terry Steam Turbine Co. Terry Sq. Hartford, Conn. U.S.A.

(Continued from Page 34)

ings. The disciple of Isaak Walton may ease his conscience on warm sunny Sunday mornings while sitting on his favorite log beside his favorite pool by adjusting his head phone and tuning in to the wave length adopted by his pastor while delivering his sermon.

Gasoline Rail Cars To Save Railroads Money

Latest Type is Shown at Railway Convention



Railroad officials, having become much interested of late in the gasoline propelled railway car, were given the opportunity a few days ago of inspecting the latest and most improved car of this type, when a White rail coach was run over the Pennsylvania railroad from Philadelphia to Washington, a distance of 136 miles. The car made the run to Washington for the annual meeting of the American Shortline Railroad Association and was the feature exhibit at the convention. It made daily runs during the convention over the tracks of the Washington & Old Dominion Railway, carrying as passengers representatives of the various short line railroads in attendance at the meeting.

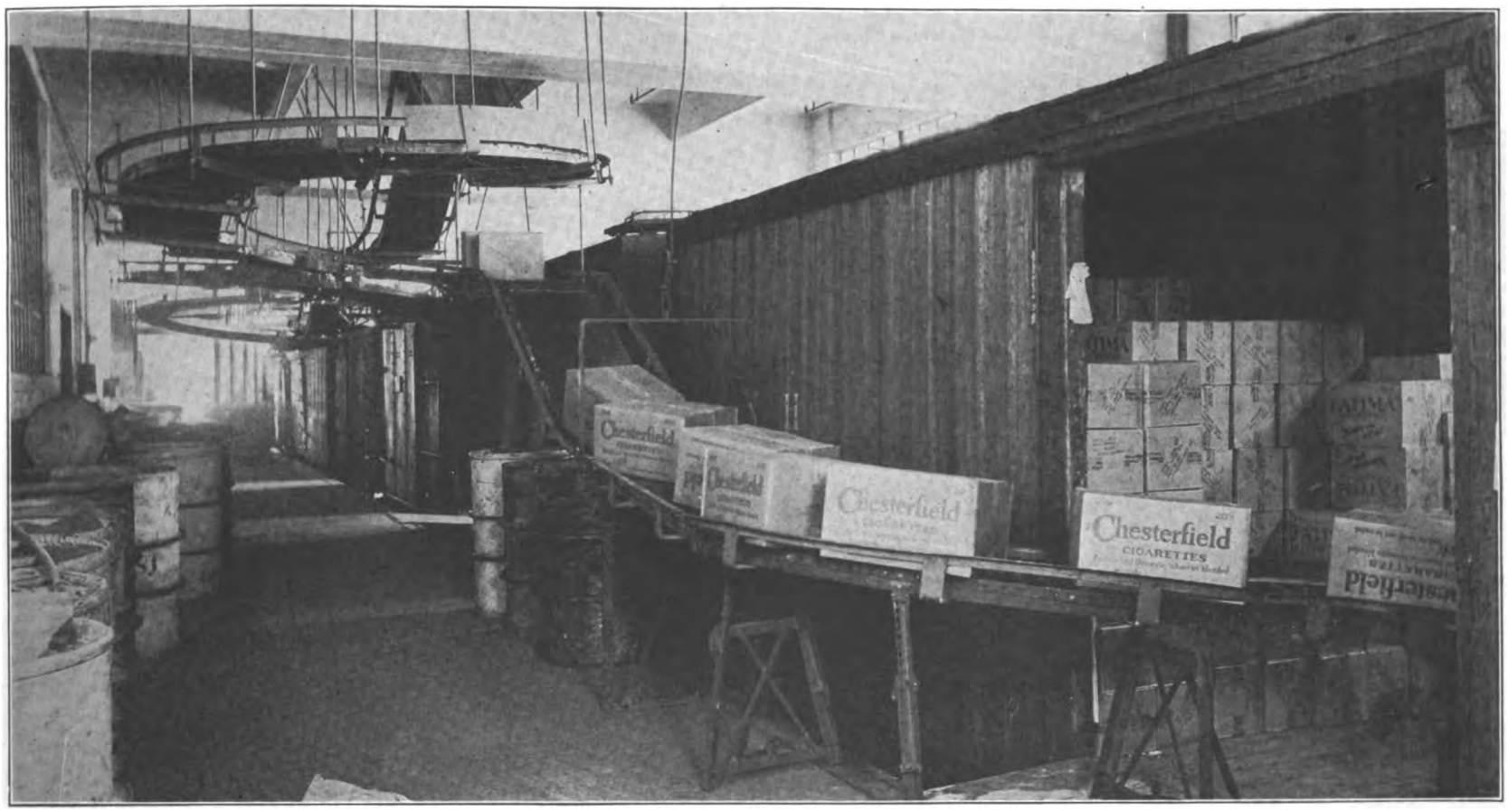
While a number of shortline railroads have been operating gasoline rail cars successfully for several years, it is only recently that the gasoline car has come to attract wide attention on the part of railroad men, not only operators of short line railways, but officials of some of the country's largest transportation systems.

Developments in the rail coach being watched with the keenest interest by railroads and the run from Philadelphia to Washington attracted numerous prominent Pennsylvania railway officials as passengers. Among the Pennsylvania executives who made the trip were: J. E. Burrell, superintendent passenger transportation, eastern region; F. K. Fildes, foreman mechanical engineers office, eastern region; J. M. Jones, passenger trainmaster, Philadelphia terminal division; H. K. LeSure, chief electrician, eastern region; H. H. Haupt, assistant engineer motive power, eastern region; J. Stair, Jr., general electrician,, New Jersey division; E. S. Stewart, advertising agent Pennsylvania system; James Buckelew, superintendent Maryland division; Timothy O'Toole, office general superintendent, southern division; Harry Babcock, passenger trainmaster Maryland division; Edward E. Hess, trainmaster Baltimore division and C. E. Wann, assistant trainmaster Baltimore division.

Other railway officials on the car were Senator George L. Shinn, president the Union

(Continued on Page 38)

Digitized by Google



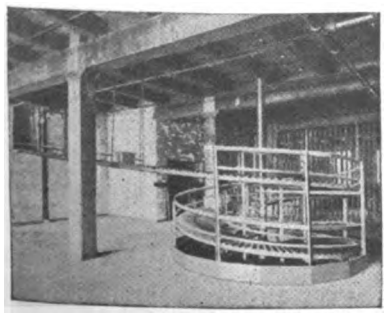
Handling Famous Cigarettes
On a Famous Conveyor

IT'S A MATHEWS

Note how the Conveying System is arranged to deliver the fibre cases into any car spotted along shipping platform, by means of a portable unit shown in foreground. Trunk lines are suspended clear of the platform, leaving same free for foot and truck traffic.

We are solving Industrial Conveying problems every day. An engineer is ready at any moment to start work on yours. No cost, no obligation.

Ask for General Catalog.



MATHEWS
GRAVITY CARRIER CO.
157 Tenth St.

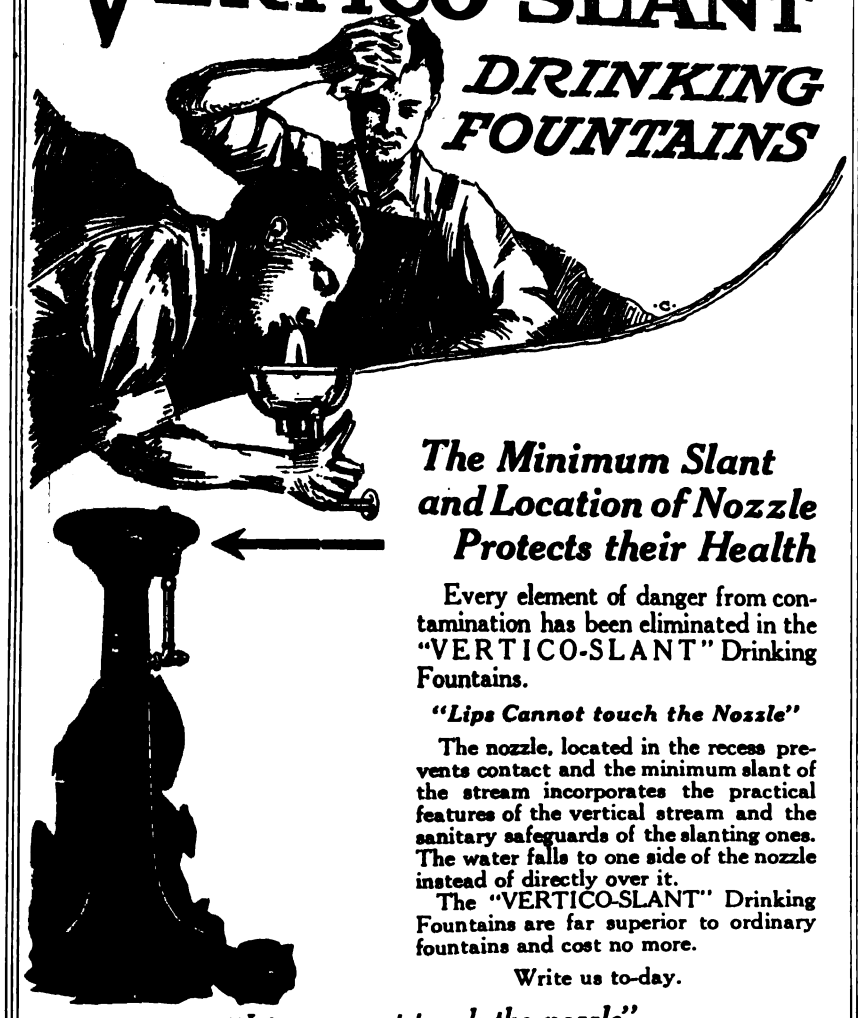
Branch Factories:
PORT HOPE, ONT.
LONDON, ENG.

ELLWOOD CITY, PENNA.



Digitized by Google

"VERTICO-SLANT"
DRINKING FOUNTAINS



The Minimum Slant and Location of Nozzle Protects their Health

Every element of danger from contamination has been eliminated in the "VERTICO-SLANT" Drinking Fountains.

"Lips Cannot touch the Nozzle"

The nozzle, located in the recess prevents contact and the minimum slant of the stream incorporates the practical features of the vertical stream and the sanitary safeguards of the slanting ones. The water falls to one side of the nozzle instead of directly over it.

The "VERTICO-SLANT" Drinking Fountains are far superior to ordinary fountains and cost no more.

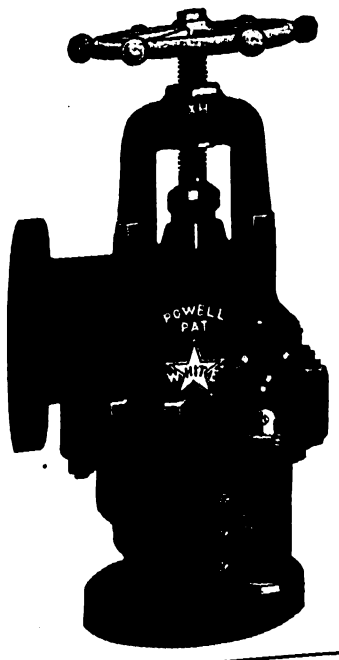
Write us to-day.

"Lips cannot touch the nozzle"

RUNDLE-SPENCE MFG. CO.
MILWAUKEE, WIS.

"WHITE STAR"

TRIPLE-ACTING NON-RETURN
REGULATING BOILER CHECK VALVE



Isolates the Boiler in Case of Accident

The Powell Triple-Acting Boiler Check Valve safeguards lives and protects property. If a boiler tube blows the valve closes, and the boiler is thus isolated from the rest.

All Powell Valves are thoroughly tested and guaranteed. Write for circular.

The Wm. POWELL CO.
2525 SPRING GROVE AVENUE
CINCINNATI, OHIO

POWELL VALVES

(Continued from Page 36)

Transportation Company, of New Egypt, N. J.; Fred Johnson, superintendent The Union Transportation Company and W. W. Wilson, general manager the Lewisburg, Milton & Watsontown Passenger Railway Company, of Milton, Pa. Representatives of The White Company, Cleveland, and the J. G. Brill Company, Philadelphia, made up the remainder of the passenger list.

The rail car driven to Washington was built for the Union Transportation Company and is now operating over the company's 25 miles of track, between Pemberton and Hightstown, N. J. The Union Transportation Company placed a 29-passenger rail car in service several months ago and its operation proved so successful that a second car of larger capacity was purchased.

The larger car—the one used on the demonstration run—has a seating capacity of 41 and a baggage compartment directly in the rear of the driver, who controls the car from the right-hand side. The body which is of semi-steel construction is mounted on a specially designed White Rail car chassis. There is a four-wheel pivotal truck in front and two wheels in rear. It is governed to a speed of 33 miles per hour. This speed was maintained with ease on the run to Washington. The satisfactory performance of the car both on the runs over the Pennsylvania and over the Washington & Old Dominion Railway from Washington to Great Falls, Va. much impressed the railroad men, who were given the opportunity of viewing its operation at close range.

The trips over the Great Falls division of the Washington & Old Dominion Railway were considered a severe test for the car as the road is a succession of grades and curves, the grades running as high as 3½ to 4 percent and the curves to 10 degrees, with a frequent combination of both grade and curve. The grades were negotiated with ease and a fair speed was maintained even on the most severe ascents. To demonstrate its reserve power the car on numerous occasions was brought to a stop when midway up a grade and again started. It accelerated readily and continued to top of grades without difficulty. This was true in both forward and reverse speeds. Refinements embodied in the latest type of rail car makes riding exceedingly comfortable. It has been the experience of The Union Transportation Company that passengers prefer riding in their gasoline rail car to their steam trains.

As previously stated, railroads are watching with keen, interest developments in the gasoline rail car, recognizing that equipment of this type offers an opportunity of better serving the traveling public and at a cost far below steam train operation.

Railroad men are pretty well agreed that the expensive part of the railroad business is the running of thousands of miles of unprofitable passenger service on light branches of light portions of main lines where the people demand service Once established, it is a difficult thing for the railroads to curtail such service even though it be unprofitable.

With recent improvements in the rail car before them, railway executives are alive to the situation and are now genuinely interested in the possibilities of the rail car as a solution to the problem of being forced to operate passenger trains where business does not justify doing so. They are convinced that the rail car, because of its light weight and low first cost, coupled with simplicity in operation and maintenance, is worthy of serious consideration.

Burning, Grinding and Sacking a Mountain

(Continued from Page 14)

in the kilns to cause the raw materials to fuse into "clinker." It costs around $1 a ton to pulverize this coal to make it possible to feed it through a blow-torch.

I am told that the significant item of more than $60,000,000

(Continued on Page 40)

Digitized by Google

BAR BUILDING

An Office Building for Lawyers

36 W. 43rd St., Through to 37 W. 44th St., New York

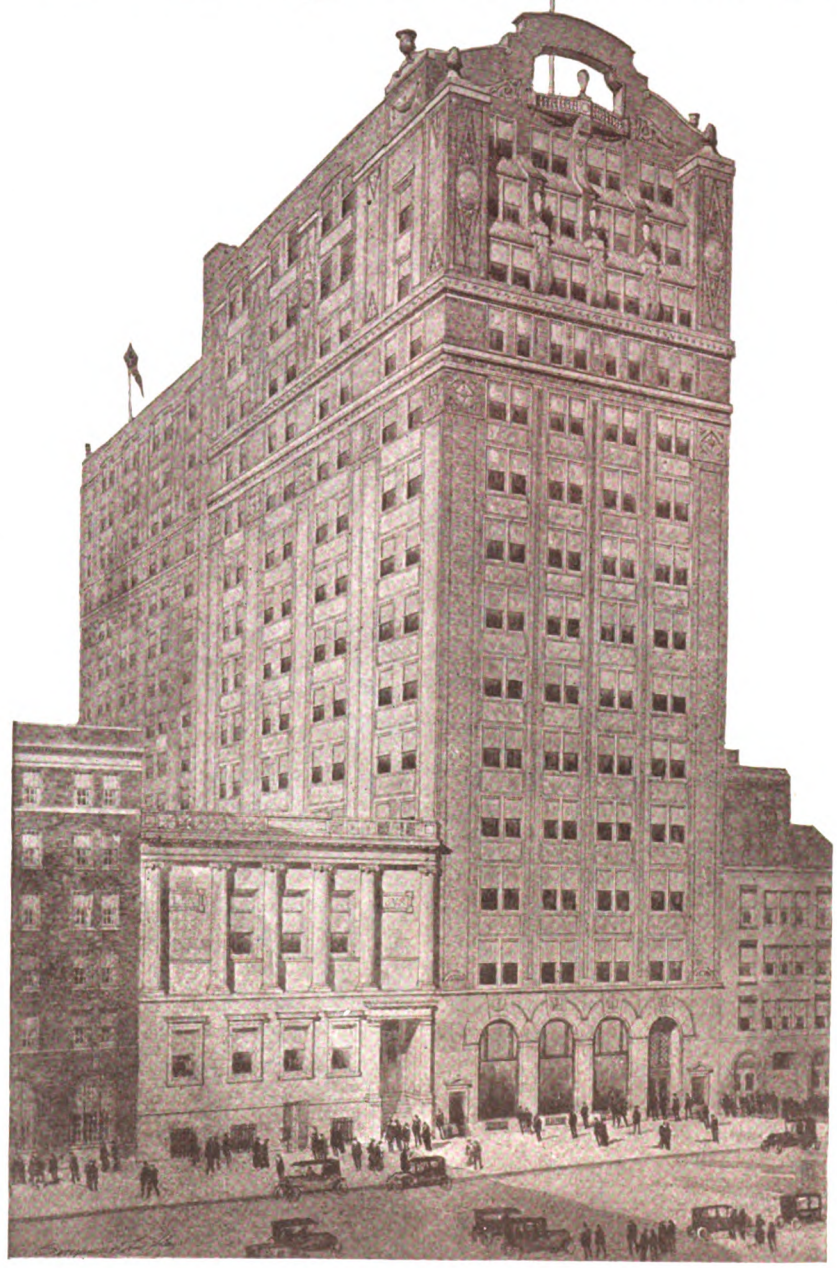
Charles L. Fraser
Building Contractor
372 Lexington Ave., N.Y.

Knickerbocker Fire-proofing Company.
Floor Arches
and Concrete Works
56 West 45th Street, N.Y.

S. H. Sweeney
Heating & Ventilating
Contractor
213-215 E. 44th St., N.Y.

Fish Brick Sales Co.
Face Brick Contractors
25 W. 45th Street, N.Y.

Campbell Metal Window Co.
Metal Windows
8 West 40th Street,
New York



Severance & Van Allen ---- ***Architects***
372 Lexington Avenue, New York City.

Gurney Elevator Co.
Elevator Contractors
300 Eighth Ave., N. Y.

South Amboy Terra Cotta Co.
Terra Cotta
Contractors
150 Nassau Street, N.Y.

Hay Foundry and Iron Works
Structural Steel
15 Madison Sq., N. Y.

Farnum Plumbing Company
Plumbing Contractors
370 Lexington Ave., N.Y.

Construction and Foundation Corporation
Rock Excavating and Foundation Work
372 Lexington Ave.,
New York City

STORES and three lower floors will be open to commercial tenants. Directly connected with the House of the Bar Association which has over 2600 members. This is the first Professional Building for attorneys in New York. Space is being rapidly absorbed by prominent men of the Profession. This building will be an asset to your business. The large store and mezzanine has frontages both on 43d and 44th Streets and display along the entire course of the Arcade which connects the two Streets.

For further Information Address Burton Thompson,
Managing Director

BAR BUILDING INC.,

372 Lexington Avenue, New York City

Digitized by Google

"VERTICO-SLANT"
DRINKING FOUNTAINS



The Minimum Slant and Location of Nozzle Protects their Health

Every element of danger from contamination has been eliminated in the "VERTICO-SLANT" Drinking Fountains.

"Lips Cannot touch the Nozzle"

The nozzle, located in the recess prevents contact and the minimum slant of the stream incorporates the practical features of the vertical stream and the sanitary safeguards of the slanting ones. The water falls to one side of the nozzle instead of directly over it.

The "VERTICO-SLANT" Drinking Fountains are far superior to ordinary fountains and cost no more.

Write us to-day.



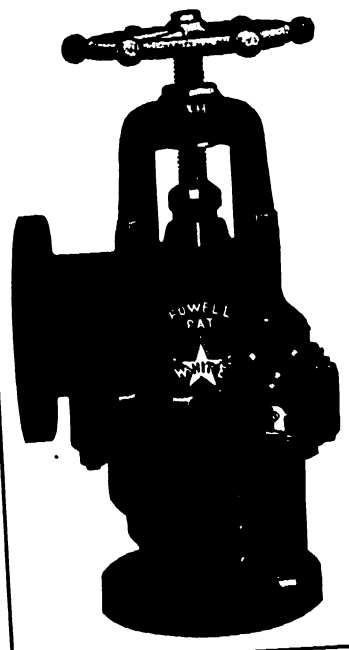
"Lips cannot touch the nozzle"

RUNDLE-SPENCE MFG. CO.
MILWAUKEE, WIS.

"WHITE STAR"

TRIPLE-ACTING NON-RETURN

REGULATING BOILER CHECK VALVE



Isolates the Boiler in Case of Accident

The Powell Triple-Acting Boiler Check Valve safeguards lives and protects property. If a boiler tube blows the valve closes, and the boiler is thus isolated from the rest.

All Powell Valves are thoroughly tested and guaranteed. Write for circular.

The Wm. POWELL CO.
2525 SPRING GROVE AVENUE
CINCINNATI, OHIO

POWELL VALVES

(Continued from Page 36)

Transportation Company, of New Egypt, N. J.; Fred Johnson, superintendent The Union Transportation Company and W. W. Wilson, general manager the Lewisburg, Milton & Watsontown Passenger Railway Company, of Milton, Pa. Representatives of The White Company, Cleveland, and the J. G. Brill Company, Philadelphia, made up the remainder of the passenger list.

The rail car driven to Washington was built for the Union Transportation Company and is now operating over the company's 25 miles of track, between Pemberton and Hightstown, N. J. The Union Transportation Company placed a 29-passenger rail car in service several months ago and its operation proved so successful that a second car of larger capacity was purchased.

The larger car—the one used on the demonstration run—has a seating capacity of 41 and a baggage compartment directly in the rear of the driver, who controls the car from the right-hand side. The body which is of semi-steel construction is mounted on a specially designed White Rail car chassis. There is a four-wheel pivotal truck in front and two wheels in rear. It is governed to a speed of 33 miles per hour. This speed was maintained with ease on the run to Washington. The satisfactory performance of the car both on the runs over the Pennsylvania and over the Washington & Old Dominion Railway from Washington to Great Falls, Va. much impressed the railroad men, who were given the opportunity of viewing its operation at close range.

The trips over the Great Falls division of the Washington & Old Dominion Railway were considered a severe test for the car as the road is a succession of grades and curves, the grades running as high as 3½ to 4 percent and the curves to 10 degrees, with a frequent combination of both grade and curve. The grades were negotiated with ease and a fair speed was maintained even on the most severe ascents. To demonstrate its reserve power the car on numerous occasions was brought to a stop when midway up a grade and again started. It accelerated readily and continued to top of grades without difficulty. This was true in both forward and reverse speeds. Refinements embodied in the latest type of rail car makes riding exceedingly comfortable. It has been the experience of The Union Transportation Company that passengers prefer riding in their gasoline rail car to their steam trains.

As previously stated, railroads are watching with keen, interest developments in the gasoline rail car, recognizing that equipment of this type offers an opportunity of better serving the traveling public and at a cost far below steam train operation.

Railroad men are pretty well agreed that the expensive part of the railroad business is the running of thousands of miles of unprofitable passenger service on light branches of light portions of main lines where the people demand service Once established, it is a difficult thing for the railroads to curtail such service even though it be unprofitable.

With recent improvements in the rail car before them, railway executives are alive to the situation and are now genuinely interested in the possibilities of the rail car as a solution to the problem of being forced to operate passenger trains where business does not justify doing so. They are convinced that the rail car, because of its light weight and low first cost, coupled with simplicity in operation and maintenance, is worthy of serious consideration.

Burning, Grinding and Sacking a Mountain

(Continued from Page 14)

in the kilns to cause the raw materials to fuse into "clinker." It costs around $1 a ton to pulverize this coal to make it possible to feed it through a blow-torch.

I am told that the significant item of more than $60,000,000

(Continued on Page 40)

Digitized by Google

BAR BUILDING

An Office Building for Lawyers

36 W. 43rd St., Through to 37 W. 44th St., New York

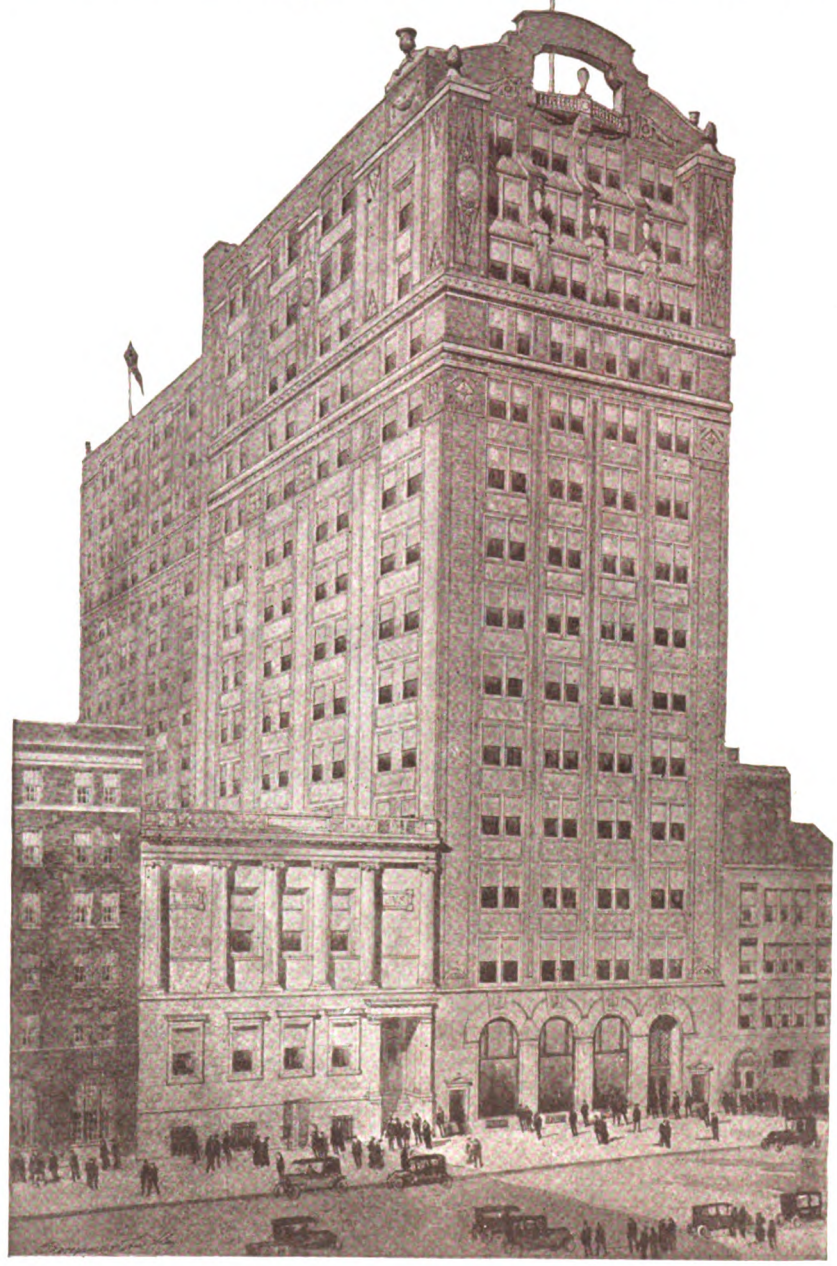
Charles L. Fraser
Building Contractor
372 Lexington Ave., N.Y.

Knickerbocker Fire-proofing Company.
Floor Arches
and Concrete Works
56 West 45th Street, N.Y.

S. H. Sweeney
Heating & Ventilating
Contractor
213-215 E. 44th St., N.Y.

Fish Brick Sales Co.
Face Brick Contractors
25 W. 45th Street, N.Y.

Campbell Metal Window Co.
Metal Windows
8 West 40th Street,
New York



Severance & Van Allen ---- ***Architects***
372 Lexington Avenue, New York City.

Gurney Elevator Co.
Elevator Contractors
300 Eighth Ave., N. Y.

South Amboy Terra Cotta Co.
Terra Cotta
Contractors
150 Nassau Street, N.Y.

Hay Foundry and Iron Works
Structural Steel
15 Madison Sq., N. Y.

Farnum Plumbing Company
Plumbing Contractors
370 Lexington Ave., N.Y.

Construction and Foundation Corporation
Rock Excavating and Foundation Work
372 Lexington Ave.,
New York City

STORES and three lower floors will be open to commercial tenants. Directly connected with the House of the Bar Association which has over 2600 members. This is the first Professional Building for attorneys in New York. Space is being rapidly absorbed by prominent men of the Profession. This building will be an asset to your business. The large store and mezzanine has frontages both on 43d and 44th Streets and display along the entire course of the Arcade which connects the two Streets.

For further Information Address Burton Thompson, Managing Director

BAR BUILDING INC.,

372 Lexington Avenue, New York City

Digitized by Google

GETTING PRODUCTION-FACTS INTO THE OPEN

Your operative wants to see how much he's producing before persuaded to do *more*—or convinced that he's doing too little.

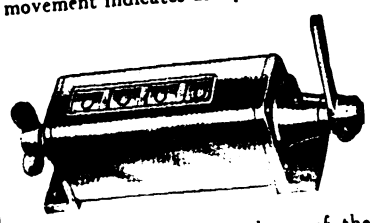
A Veeder Counter on his machine shows *him*—and the management—what his machine should turn out as a reasonable standard for the day's work.

If he does *less* than is fair the counter advertises the fact to all. If he does *more,* his claim to reward is equally plain. Thus do

Veeder
COUNTERS

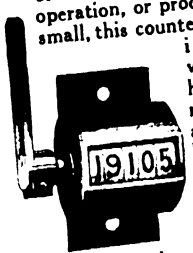
put the facts in the open, afford assurance of fair play and offer an obvious incentive.

The Set-Back Rotary Ratchet Counter below is for machines such as punch presses and metal-stamping machines, where a *reciprocating* movement indicates an operation.



Registers one for each throw of the lever, and sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figures, as illustrated, $11.50—subject to discount. (*Cut less than ½ size.*) Set-Back *Revolution* Counter of similar model, $10.00 (list.)

The small Revolution Counter below registers one for a revolution of a shaft, recording a machine operation, or product. Though small, this counter is very durable; its mechanism will stand a very high rate of speed, making it especially suitable for light, fast-running machines, and most adaptable for experimental work. If run backward. the counter subtracts. Price $2.00. (*Cut 3/5 size.*) Small Rotary Ratchet Counter, to register reciprocating movements of small machines, also $2.00.



There's a Veeder exactly suitable for the type of machine you want one for; ask for free illustrated booklet.

The Veeder Mfg. Co.,
63 Sargeant St., Hartford, Conn.

(*Continued from Page 38*)

for labor was parcelled out among the hundred million barrels.

When you talk to a cement man his dry-as-dust subject is elevated from the commonplace and takes on a good deal of the romantic, which the outsider never sees in the other man's vocation. Just another way of saying that to each of us out particular calling is filled with romance. The great investment required before a cement plant becomes a going concern doesn't make cement manufacturing an inviting field of endeavor. Then too, cement marketing suffers the seasonal influence of the so-called construction season. A year's business must be concentrated into practically seven months. This reaches its peak often during the most active seasons for other industries, and as a result makes inevitable periodic congestion in transportation and distributing facilities. There is this constant handicap against capacity production. The fewer than one hundred producing plants in the United States, with a possible production of nearly 140,000 000 barrels per year, were never able until 1920 to exceed the hundred million barrel mark. In 1921, production fell back to 97,849,-000 barrels due in part to the difficulties just related.

The iron age and the stone age are a matter of history. Occasionally we go back to "cave-man stuff." We are now entering the Cement Era.

It will surprise most people to know that exclusive of the functions of selling, accounting, and administration, the following operations are necessary to preparing a barrel of portland cement for the market:

LIMESTONE QUARRY
1. Drilling
2. Blasting
3. Pop shooting
4. Loading (steam shovel)
5. Transportation (locomotive and cars)
6. Track and Car maintenance

SHALE QUARRY
7. Drilling
8. Blasting
9. Loading (steam shovel)
10. Transportation (locomotive and cars)
11. Track and car maintenance

RAW DEPARTMENT
12. Primary crushing
13. Elevating
14. Secondary crusher
15. Elevating to storage bin
16. Storage (distribution in bin)
17. Proportioning of raw materials (mixing and conveying to dryer elevator)
18. Elevating to dryers.



Construction Costs
Have Reached the Bottom!

THE cost of building factory structures is at the lowest point since 1913. The increase in demand for additional manufacturing space which is already following the resumption of activities in many lines will soon produce an increase in building costs. Those who need factory space but have waited for the lowest point in building costs can profit by building during 1922.

Thirty Years
MRBN
of
Industrial
Buildings

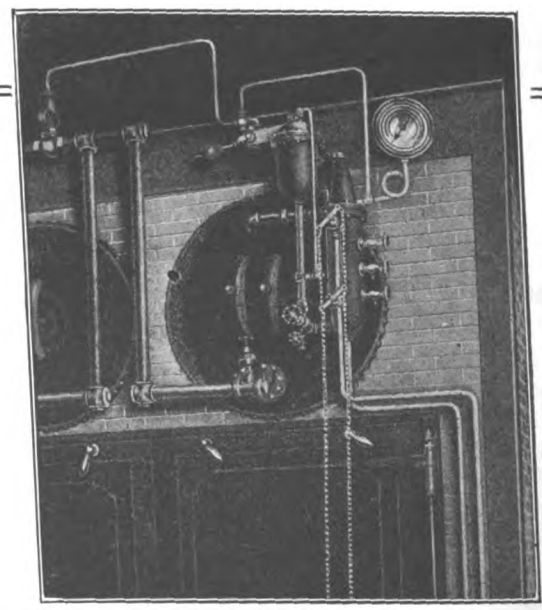
An additional saving can be made by employing "MRBN" Engineers to plan the building for you. Write for one of the members of our firm to come and outline to you our method of handling the design of industrial buildings at minimum cost to you.

Build Now!

MILLS · RHINES · BELLMAN & NORDHOFF
Engineers
TOLEDO · OHIO

60

VIGILANT
Feed Water Regulator



Saves 6 to 15% Fuel Bills

The VIGILANT Feed Water Regulator keeps the water level at a fixed point irrespective of fluctuations in the load. It does it automatically. ¶ There are no complicated parts to get out of order—it depends for its operation on gravity. The action is therefore positive and always reliable. ¶ For over 20 years some of the largest plants have depended on the Vigilant for feed water regulation, and in many cases it effects fuel savings of from 6 to 15%. ¶ Write and get particulars and the reason why.

The Chaplin Fulton Mfg., Company
28-36 Penn Ave. Pittsburgh, Pa.

Digitized by Google

19. Drying
20. Elevation to bin over preliminary grinders
21. Preliminary grinding
22. Conveying to elevators
23. Elevating to raw finish mills
24. Grinding by raw finish mills
25. Conveying to elevators
26. Elevating to kiln bins

CLINKER DEPARTMENT

27. Burning in kilns
28. Elevating hot clinker to coolers
29. Coolers
30. Adding gypsum to clinker
31. Elevating to preliminary clinker grinders
32. Preliminary clinker grinding
33. Conveying to elevators
34. Elevating to clinker finish mills
35. Grinding in finish mills

CEMENT

36. Conveying to elevators
37. Elevating to belt conveyors
38. Belt conveyors to stockhouse
39. Conveyor (distribution in stockhouse)

SHIPPING DEPARTMENT

40. Conveyor in tunnel under stockhouse
41. Elevating to packing bins
42. Packing (filling bags)
43. Loading in cars
44. Cleaning sacks
45. Counting sacks
46. Repairing sacks
47. Tying sacks
48. Inspecting loaded cars
49. Track maintenance
50. Cleaning and repairing cars

GYPSUM

51. Unloading
52. Elevating
53. Conveying to grinders

COAL MILL

54. Unloading
55. Elevating to dryer bin
56. Drying
57. Elevating to grinder bin
58. Preliminary grinding or small crusher
59. Elevating to finish mill
60. Finish grinding
61. Elevating to conveyor
62. Conveyor to kiln bins
63. Firing of kilns and dryers

POWER DEPARTMENT

64. Unloading coal
65. Elevating to bins
66. Firing of boilers
67. Moving of ashes
68. Pumping water
69. Operation of power units
70. Yard gang
71. Machine shop
72. Repair gang

CHEMIST WORK

73. Sampling rock
74. Sampling clay
75. Sampling gypsum
76. Sampling coal
77. Analysis all four
78. Sampling clinker
79. Analysis cement
80. Testing and making briquettes
81. Testing each car before shipping

SUPERVISION

82. General supervision, including:
    Superintendent
    Assistant superintendent
    Chief engineer
    Chief chemist
    Safety committee

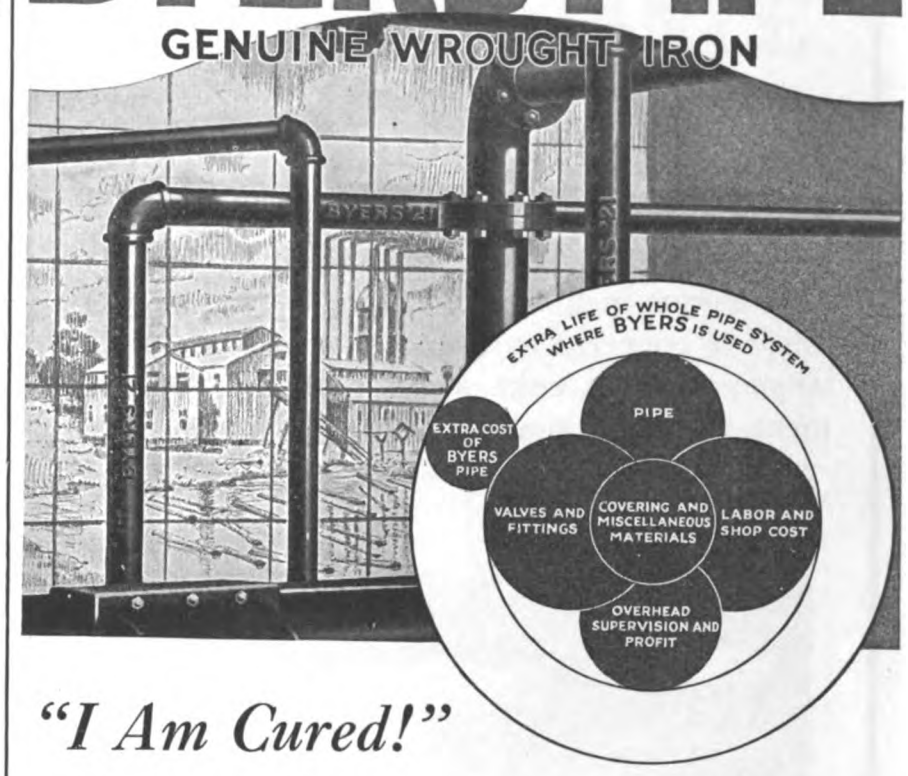


Duplex Radio Telephone Equipment on S. S. America which made two-way wireless conversation possible.

Photograph by General Electric Co.

BYERS PIPE

GENUINE WROUGHT IRON



"I Am Cured!"

said an architect to a Byers salesman. "I never attached much importance to the subject until a pipe, buried in my living room ceiling, burst and did $3,000.00 worth of damage to floors, walls, draperies, rugs and furniture. From what I have since found out about pipe, I have decided to allow no clients of mine to be quite as foolish as I was myself. From now on, I will specify Byers pipe for all permanent buildings."

Even leaving out of consideration this possible damage to the building and furnishings, the cost of pipe failures is ten or twenty times greater than the bare cost of the pipe itself. And the extra cost of Byers rust-resisting pipe measured against the installation cost, is only 5 to 10%. (See diagram). And this small amount is the means of greatly increasing the life of the installation, reducing maintenance cost, and preventing serious damage to the building and its contents.

Send for Byers Bulletin No. 38, "The Installation Cost of Pipe"

A. M. BYERS COMPANY, PITTSBURGH, PA.

Established 1864

New York · Philadelphia · Boston · Chicago
Cleveland · Houston · Dallas · Los Angeles

1 Kennedy Bldg., Tulsa, Okla. Architects, A. W. Black & Son, Tulsa. Byers Pipe for plumbing and heating systems.

2 St. Mary's Boys Dormitory, Winona, Minn. Architect, C. H. Johnston, St. Paul, Minn. Byers Pipe forplumbing and heating systems.

3 Stacy-Trent Hotel, Trenton, N. J. Architects, Esenwein & Johnson of Buffalo; associated with Architects William A. Klemann and J. Osborn Hunt, of Trenton. Byers Pipe for plumbing and he ting systems.

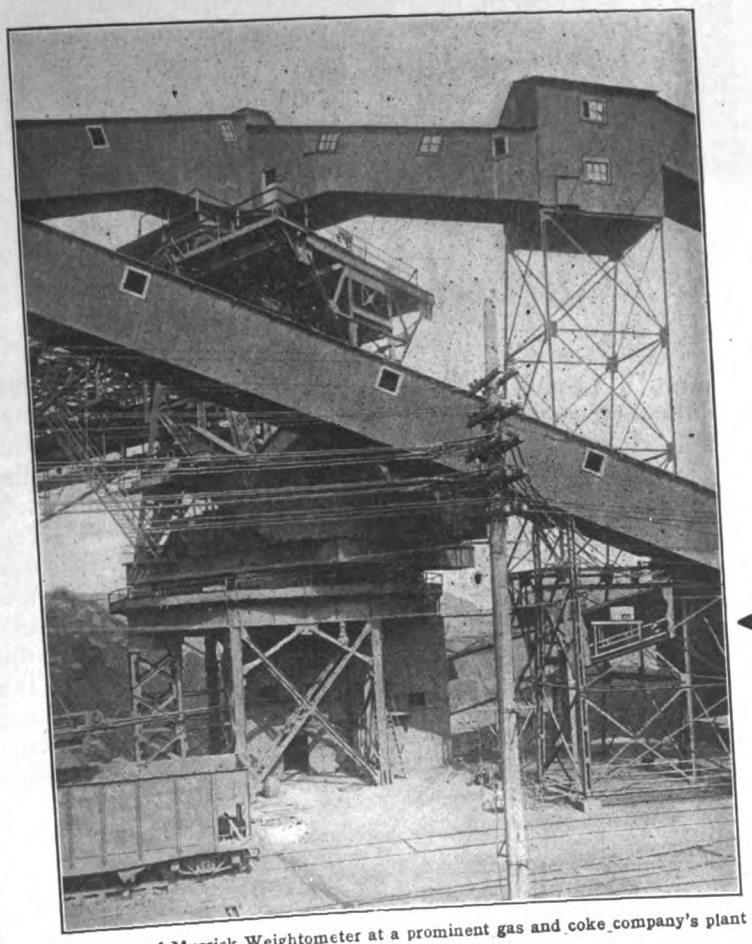


Look for the Name and Year rolled in every length

Digitized by Google

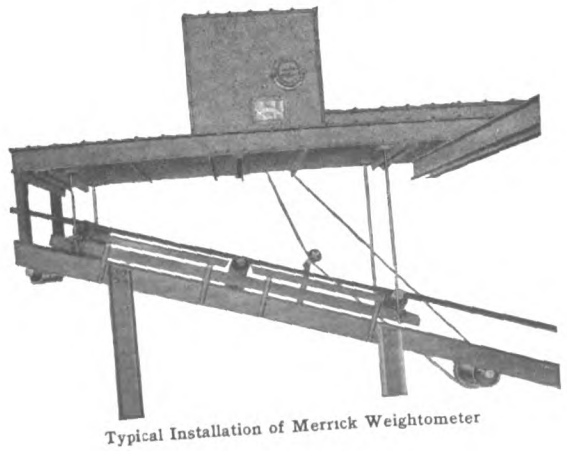
WEIGH IT WHILE MOVING

Any material handled on a conveyor fitted with a **MERRICK CONVEYOR WEIGHTOMETER** is automatically weighed as it moves along. This unique method of weighing is used by hundreds of concerns weighing all classes of material such as coal, coke, stone, ores, fertilizers, cement, clinker, copra, sand, gravel, etc. etc.



Installation of Merrick Weightometer at a prominent gas and coke company's plant

NO WEIGHMAN OR ATTENDANT REQUIRED
GUARANTEED AND PROVEN
99% ACCURATE



Typical Installation of Merrick Weightometer

For Information Write

MERRICK SCALE MFG. CO.,
PASSAIC, N. J.
180 Autumn Street

Concrete, as Used in Ancient Rome

(*Continued from page 11*)

seemed to think it desirable to face their concrete is scarcely evident to modern eyes. The concrete when constructed of hard lava or travertine set into rock as lasting as marble, and the facing always came off before the concrete showed signs of destruction. Moreover the facing itself was often covered with stucco, as a basis for which the concrete could easily have been made better than the facing itself.

The Romans adopted concrete construction for many different purposes. It was of course of the greatest use for harbors as evinced by various remains of docks and wharfs. It was employed to line certain of the aqueducts, and the basins of the buildings from which the water was distributed, to say nothing of its use—in public and private baths. They even carried the cement to distant parts of the Empire, and made blocks with it for the facing of fortifications.

In making concrete floors, they appreciated the fact that great care had to be taken in order to avoid cracks. The general method of construction of such a concrete floor as described by Vetruvius may be quoted in part:

"I begin with the concrete floor which is the most essential of the concrete finishings, pointing out that great skill and the utmost care must be used to assure its durability. If this concrete flooring is to be laid even with the ground, let the earth be tested to see whether it is solid there, and if it is, level it off and upon it lay broken stone for a foundation. But if the floor must be either wholly or partly filled in, this should be pounded down hard with great care. In case a wooden framework is beneath, however, we must see that no wall which does not reach up to the top of the house is built under the floor. No wall which is there should fall short so as to leave a wooden planking above it as an unsupported span. If a wall comes up solid, the unyielding nature of its solid structure must, when the joists begin to dry, or to sag and settle, lead to cracks in the floor on the right and left along the line of the wall."

What the Worker Wants

(*Continued from page 15*)

they wanted. Twenty-six lived near enough to eat at home, and the remainder would rather eat a lunch which they brought from home.

Replying to question 5—*Do you believe that employees should have a voice in making the rules they work under?*—the almost universal response was that they would like to have such a chance. Nine answered to the effect that they believed it the duty of the employer to make the rules and if the employee did not like it he could get out.

Question 6—*Are you fitting yourself for something better through a systematic study?*—surprised me. There were only four hundred and sixty-five making any form of a study to better themselves. The remainder claimed they were not overloaded with time for studying. This was due to long hours of work and much time to get back and forth to work.

Over seven hundred favored some form of a club in answer to question 7—*Do you favor clubs made up of employees?*—The remainder felt they would rather spend their time at home than at a company club.

In answer to question 8—*Are you married?*—I found seven hundred and sixty-two to be married. One hundred and sixteen lived away from home. The remainder lived at home.

Three hundred and ten lived in their own homes or were buying them. Five hundred were living in rented homes but wanted to buy.

Over nine hundred would rather own than rent. How-

(*Continued on Page 44*)

Digitized by Google

USER REPORT SERIES

3

Written by users of B-G Machines
Audited by H. P. Gould Co.

No part of this report written, altered or even seen by Barber-Greene.

Finished report as quoted here is only report which was delivered to us

PROOF OF PERFORMANCE

— by cost analysis



FOR five years the Mechanical Rubber Co., of Chicago, Illinois, has used a Barber-Greene portable belt conveyor for handling coal and ashes. The cost analysis shows:

1. Annually 14,000 tons of ashes have been handled by the conveyor.
2. During one period of three weeks, the machine loaded 500 trucks with ashes. Five-ton trucks were frequently loaded in six minutes.
3. Loading of ashes by hand would require at least three times the labor now employed.
4. Original belt in use five years and still being used. No other repairs except on motor.

The machine is moved about the yard from one point to another where it is needed. It has proved itself adaptable and reliable. The following is part of the cost analysis furnished us by the H. P. Gould Co., industrial auditors, and Mr. A. MacLean, chief engineer of the Mechanical Rubber Co.

EXCLUDING LABOR

Depreciation $\frac{\$900.00}{10 \text{ yrs.}}$	$ 90.00
Average interest at 6% $= \frac{11}{10} \times \frac{\$900.00 \times .06}{2}$	29.70
Maintenance and repair, estimated	50.00
Power—9 KWH. per day at $.01 per KWH. x 300 days	27.00
Total annual operating cost (excluding labor)	$196.70
Cost per day $\frac{\$196.70}{300 \text{ days}}$	$ .6556
Cost per ton $\frac{\$.6556}{46 \text{ tons}}$	.0142

INCLUDING LABOR

Cost of B-G Conveyor per day	$ .6556
Cost of labor per day, 3 men, 3 hours per day at $.60 per hour	5.40
	$6.0556
Cost per ton $\frac{\$6.556}{46 \text{ tons}}$	$ .1316

Send coupon for a copy of the complete report

Barber-Greene Company

470 W·PARK AVE. AURORA, ILLINOIS

Branches in Most Principal Cities

BARBER-GREENE COMPANY
470 W. Park Avenue, Aurora, Illinois

Please send Gould Report No._____. I am interested in handling _____. No obligation.

Name_____
Position_____
Company_____
City_____
State_____

Digitized by Google

(Continued from Page 42)

ever, many stated they had not bought because they were not intending to stay in the place they were. These, as a result of the question—*Which would you rather do: rent, live in furnished rooms, or board?*

Practically all said in answer to question 10—*Should a company help their employees build homes or pay them more wages that they might build themselves?*—that the companies could build cheaper than they could; yet, if the cost was the same, over six hundred would rather have more wages and build themselves.

Question 11—*Should the company educate their employees in their own plant or allow them to be educated in outside schools?*—Over eight hundred preferred to be educated in outside schools. These wanted such an education as would be of value when they should leave their firm. The remainder believed one would be as good as the other.

Those answering the question—*Should the company furnish a garage for employees to keep their automobiles in? If the employer expected you to keep a bicycle or automobile out in the rain and sun would it have any effect upon your working for him?*—indicated that there were about one hundred and sixty who rode bicycles and about sixty who went to and from work in automobiles. These believed that proper shelter should be furnished employees for automobiles and bicycles from wind and rain while they worked.

Question 13—*Would you join any cooperative associations made up of employees for the improvement of conditions either at home or in the plant?*—

Over eight hundred answers indicated that employees were interested in cooperative associations if composed entirely of employees. The remainder felt that there would be no value to be had from such associations.

About six hundred expressed in reply to question 14—*Do you believe rest rooms helpful?*—that rest rooms were helpful, while the remainder expressed a varied lot of ideas to the effect that they would not have time to make use of them.

In reply to question 15—*Would you do work you did not like, for more money, rather than work you did like, for less?*—there were over seven hundred and fifty who would rather do work they liked for less money while the remainder did not care as long as there was money in it.

The replies to question 16—*How many hours should a man work?*—were almost unanimous for the eight-hour day. Some said that the only reason they wanted to work longer hours was on account of the money. All felt that a man could do as much in eight as in ten hours.

In answer to—*Would you work nights for the same money as days?*—there were only fifteen who would rather work nights for the same money as they would get days.

In reply to number 18—*Which hours would you prefer: the eight hours beginning at seven in the morning, three in the afternoon or eleven at night?*—there were six hundred and thirty-four (five hundred and sixteen married) who preferred starting work at seven in the morning. Two hundred and eleven (one hundred and ninety-four single) who preferred to start at three in the afternoon and the remainder preferred to start at eleven at night (four of these were married).

Would you work at a factory that had poor street car service?—There was a general objection to working at a factory with poor street car service by those who were compelled to ride them. Over three hundred expressed themselves that they would not work unless there was ample service provided.

Should the foreman have the full right to discharge?—Over seven hundred and eighty believed that the foreman should not have the right to fire. This was because in such a case a man would be fired who might be first class but for a personal grievance.

Eight hundred and ninety-five, in answer to—*If you were capable of being foreman and a new foreman was brought in from the outside for your department would you quit?*—said they would quit, while the others ranged from "depending upon how well they liked the place," to the possibility of something better of a different sort later.

Would you study a corre-



Save Floor Space—

use the ceiling.

Do your trucking overhead and make the ceiling pay more on the investment.

Many firms are daily realizing the fact that **Cleveland Tramrails** have reduced their material handling costs to the lowest possible point.

You too, can enjoy these low costs.

There is a standardized **Cleveland Tramrail**—either hand or electric—that will adapt itself to your particular type of hoisting and conveying.

Let us hear from you. May we have this privilege?

Cleveland Electric Tramrail Division of The Cleveland Crane & Engineering Co. Wickliffe, Ohio

Sales Offices:

50 Church Street. New York City

Farmers Bank Bldg. Pittsburgh, Pa

1418 First Nat. Bank Bldg. Chicago, Ill.

149 E. Larned St. Detroit, Mich.

CLEVELAND HAND OR ELECTRIC TRAMRAILS

Digitized by Google



"AS PER PHOTOSTAT Copy HEREWITH"

This phrase is coming into general use in business offices, because each day another company realizes that the PHOTOSTAT way is, for many purposes, the quickest, the most economical and an error proof method of copying. The PHOTOSTAT method costs cents where other methods cost dollars, produces at a possible speed of one copy per minute, and

The PHOTOSTAT makes no mistakes. It makes photographic facsimiles.

When it is necessary to show valuable documents in some business transaction and you do not wish to send the originals out of the office. PHOTOSTAT copies are equally acceptable as they are legal evidence in court.

But the uses for the PHOTOSTAT do not end in the office. The PHOTOSTAT is also used in the production department. Here it eliminates the necessity of making tracings, as it copies direct from blueprints, pencil sketches, ink drawings or even from the original object, within certain limits of size.

It is the numerous and valuable uses of the PHOTOSTAT which in many cases pay for the installation in less than six months.

Write or telephone our nearest office.

PHOTOSTAT CORPORATION
295 STATE ST., ROCHESTER, N. Y.

88 Broad St., Boston	510 No. American Bldg., Philadelphia
123 W. Madison St., Chicago	317 Third Ave., Pittsburgh
209 Leader Bldg., Cleveland	429 Monadnock Bldg., San Francisco
7 Dey St., New York City	601 McLachlen Bldg., Washington.

Executive Office: Providence, R. I.

PHOTOSTAT
Trade Mark

spondence course to improve your ability?—Over seven hundred and sixty said they would study a correspondence course while the remainder believed they could not derive a benefit from such a course.

* * * *

The questionnaire used in determining from the employer's point of view what he thought the employee wanted, brought out some peculiar information. On hundred executives were questioned in the same cities. Yet later in this article my comparisons will show what a vague idea employers have of the things employees really want.

Ninety answers to question 1 stated that they did not believe advancement counted in an employee choosing a place. The rest believed it did.

Almost unanimous response was obtained that executives believed employees objected to entrance training.

Fifteen believed that the employee preferred well-ventilated buildings; eighty-five believed that it did not make any difference.

Ninety-two believed that employees preferred to carry a lunch and sit down by a machine or bench and eat it. The remainder believed the restaurant was preferred.

Nearly eighty declared that their men would like a voice in making rules if they could get it. Ten believed they did not want a voice while the remainder could not answer definitely.

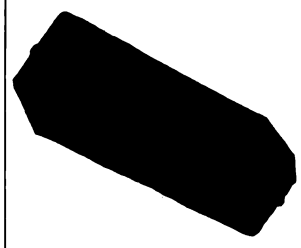
Ninety-six claimed that employees did not care to study nights to improve themselves. Four admitted good results from their employees studying nights.

Ninety-three claimed that employees did not care for clubs unless it would take them from their work with full pay. They insisted that attending clubs on their own time was not desired by their employees. The others had had pleasing results from clubs on employees' time.

I was surprised that eighty-nine should claim that the married man made the best workman. The other eleven could not determine much difference.

Ninety-six believed the employees wanted the employers to build their homes for them. Four believed the worker wanted to build his own. And

A Stamping Service
That Lowers Unit Costs



Hundreds of manufacturers now realize that G. P. & F. Stampings and Sheet Metal Parts are not only lighter and stronger than Castings, Forgings and Wooden Parts but also opens the way to lower production cost.

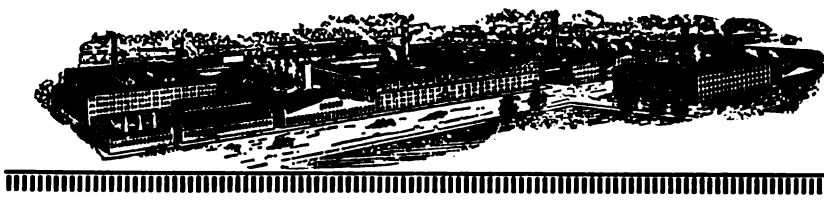
G.P.&F. Service

offers a 15-acre plant to meet your requirements for STAMPING, SPINNING, DRAWING, BLANKING, FORMING and PUNCHING in STEEL, ALUMINUM, COPPER, ZINC, BRASS or TIN.



Send us your Blue Prints or Samples for estimates. It entails no obligation. Write us to-day.

GEUDER PAESCHKE & FREY CO.
1300-1800 CANAL ST., MILWAUKEE, WIS.
DETROIT OFFICE: 712 DIME BANK BUILDING
CHICAGO OFFICE: 352-358 WEST OHIO STREET



HAYS APPARATUS



Hays Draft Gage

Hays Draft Gages for the boiler front. They tell the firemen how to regulate his damper, the condition of fires, baffles, settings, etc. They are the compass by which the fireman steers the furnace. Black enamel finish, 1 inch range, $14.00.

The Hays Improved Gas Analyzer with its special metal needle valves instead of glass cocks or pinch clamp or rubber connections, its Hays patented steel wool method of absorption, its heavy moulded glass parts held by packing nut connections and its compact, rugged construction is the finest instrument of its kind on the market. CO_2 analysis in 30 seconds. Complete analysis for CO_2, O_2 and CO, in 4 minutes. Accurate to 1-10 of 1%. Three chamber analyzer $40, CO_2 only analyzer $30.



Hays Improved Gas Analyzer



Hays Automatic CO_2 and Draft Recorder

The Hays Automatic CO_2 and Draft Recorder tells the complete story of furnace conditions. Firemen can head-off wasteful tendencies because they have up-to-the-minute facts before them. "What", "why" and "when" are pictured on the Hays Charts.

Hays Apparatus pays for itself out of savings in a short time. No matter what kind of fuel you use these instruments can guide you in the way to burning less.

Tell us about your fuel and equipment and let us make recommendations.

The Jos. W. Hays Corporation
Combustion Efficiency Appliances
1038 E. 8th St., Michigan City, Ind.

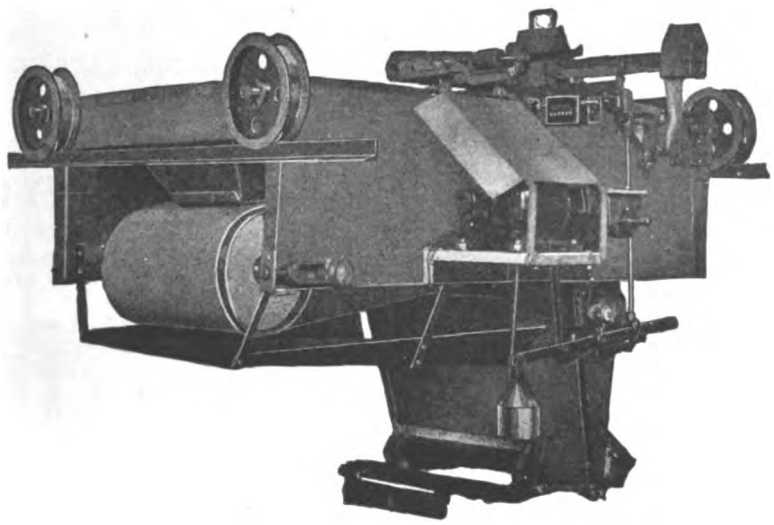
Digitized by Google

Which of Your Boilers Burns the Most Coal?

Wasting Coal Is Wasting Power

Prevent It

By accurately checking the consumption of all of your boilers



RICHARDSON Automatic Coal Scales

Operate automatically and register accurately every pound of coal delivered to stokers per hour shift or day.

If a boiler isn't giving you the best efficiency, it will use more than the ordinary amount of coal. The trouble may be due to soot, scale, holes in fire, or to other causes that can be quickly detected if you know exactly how much coal the boiler is using.

A Richardson by weighing the coal automatically as it leaves the overhead bunker before delivery to stoker offers the practical solution of the problem of avoiding unnecessary waste of coal. The machine **will weigh any kind of coal,** wet, damp, muddy or frozen, easily and accurately. **Continuous records of consumption per boiler are always available for day and night shifts.**

Send for bulletin 2059-A.

RICHARDSON SCALE COMPANY

Passaic, New Jersey

New York Boston Buffalo Chicago San Francisco

only two believed home-owners were the best workers.

Ninety-two did not believe employees sought for an education either in the plant or outside. Six believed the employee would consider the real value of the education offered regardless of wherefrom. Two believed employees preferred company education because it was free.

Ninety-one claimed that they have never had a complaint as to garage facilities. Seven claim employees want a place to leave their bicycles and automobiles. Two could not answer.

Ninety-two asserted that employees use the rest rooms only during working hours; seven, that they are used during rest periods; one employer claims that they are not used at all.

Employers asked unanimously declared that money will attract men more than the kind of work.

Ninety-six claim men will work up to twelve hours for overtime and that they will loaf half of the time. Four believed the employees preferred a nine-hour day. (These four had a nine-hour day in force.)

As to night work, ninety-three could not decide whether men preferred days or nights; seven believed the men preferred days.

Ninety-seven could not answer whether poor street car service kept employees away from the plant or not. Three answered that many men quit because of poor street car service. (Two of these rode the cars.)

Eighty-six believed that employees preferred to have the foreman have the full right to discharge them. Ten believed they preferred to have some one higher up discharge them. Four were undecided.

Ninety-three did not believe their men cared how many men were brought in from the outside for good jobs. Seven believed that the older employees in point of service wanted the better jobs. Five never hired a man for the better job, but expected each man to work up.

Eighty-three did not believe employees were interested in correspondence courses. Eleven could not answer. The remaining six believed they did. (Four paid for courses employees would study and show progress in.)

As my questioning has been verbal, with the use of a notebook, I have chosen at random. I asked employees with whom I worked and employees I hired at the Studebaker Plant and at the Stenotype Company. Through the entire time I made special notes upon each one, as to his desirability, ambitions and education.

I find that, foremost in every employee's mind, he is looking for something better with responsibility; or he is shiftless and undesirable. The employee wants a place of neat appearance both interior and exterior. The corner of a factory grounds in western New York on the Erie Canal shown at the beginning of this article is the most beautiful spot I have ever seen on any factory property. Employees are always talking about such places and during the summer months it is surprising how many sit out there during their rest period.

The majority of workers, if paid as much for working eight hours as they would earn in ten will do more in eight and feel better.

Employees do care for the restaurant with its warm meal at noon.

I have noted in some factories where every man carried a lunch before a restaurant was opened, the first day the restaurant was opened only ten or twelve out of one hundred carried their lunch. However, I have seen company restaurants feeding very few. This was because portions were set out and a meal would cost sixty cents or more while the employees could go to an outside restaurant owned by private individuals and get a meal where everything was set before them in big dishes and help themselves to all they wanted for forty cents. Of course employees object to that sort of thing.

The most remarkable meal that I have ever seen is that put up by the Prest-O-Lite Company in their main factory. Here a meal is had for twenty-five cents—and all a man can eat. I can judge as I have eaten at over one hundred such restaurants and talked with those who have been eating in them.

Of course the worker is interested in the wage question.

(Continued on Page 48)

Digitized by Google

—lower costs

—larger output

—reduced wastage

—smaller labor turnover

—more intelligent teamwork

—improved relations with the working force

—keener interest in managerial policies and plans

THE above are some of the results actually achieved by the 500 progressive companies which have installed a well-thought-out program of foremen training.

The foremen are the key men in your organization. Give them a chance to help you effectively in building up profits.

During the past four years the Business Training Corporation has conducted *not less than 80 per cent* of all the training for foremen carried on in the United States. This record is in itself a sufficient guarantee that the training is sound and practical. It appeals strongly to the foremen themselves. The meetings are conducted by members of an experienced lecture staff. The expense is moderate.

Foremen training is an important development as to which every industrial executive should be thoroughly informed. Write today for our descriptive booklet—sent without obligation—called "Making Better Foremen."

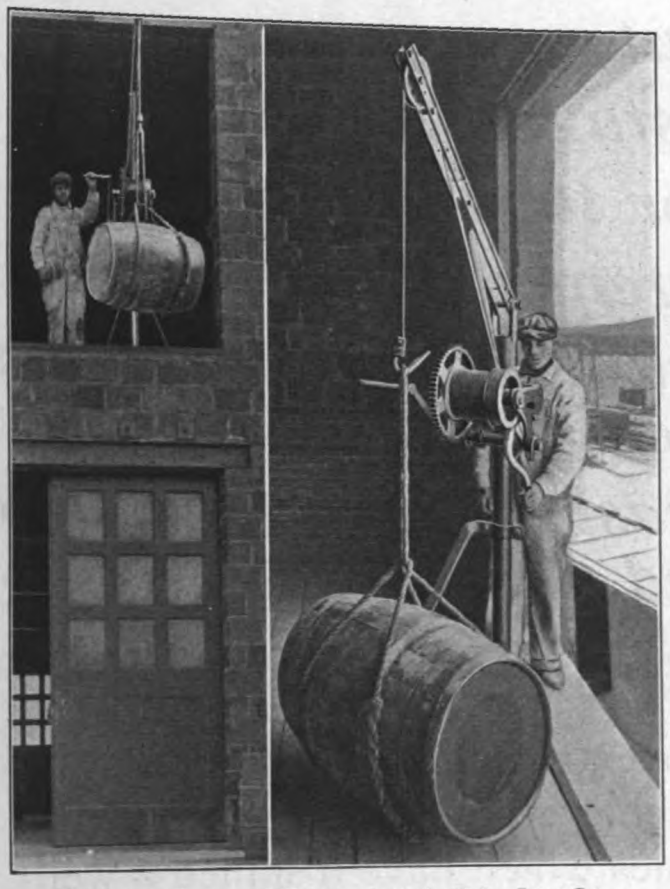
Business Training Corporation

"Greater Team Work Through Group Training."

185 Madison Avenue *New York City*

Digitized by Google

G&G



G&G manually operated Hoist in use at the Riches-Piver Co., chemical plant at Lyons Farms, N. J.

From Loading Platform to Warehouse Floor—One man easily handles barrels, etc., with a G&G Hoist—

AT the Lyons Farms, N. J., plant of the Riches-Piver Chemical Co., 1 man with a G&G Model B Hoist raises barrels, drums, carboys and other loads quickly and inexpensively, and with a real saving in labor costs. With less efficient methods of load handling, from 4 to 6 men would be required to do an equal amount of work.

And the work is easy for the operator—a pressure of only 7 lbs. on the hoisting handle for each 100 lbs. of load.

If your plant handles loads up to 1000 lbs. between floors or from cellar to grade, there's a G&G Hoist which will fit your particular need. Five models, electrically or manually operated.

If you will tell us the number of loads you average daily, the distance of lift and kind of load, something about the working conditions of your plant (submit sketch if possible) we will make definite recommendation as to what type of hoist to use and its cost.

GILLIS & GEOGHEGAN
556 West Broadway New York City

the G&G
REG. U.S. PAT. OFF.
Telescopic Hoist
with Automatic Gear Shifting Brake Device and Silencer

G&G

(Continued from Page 46)

Yet, after talking with many regarding this question, I find that the average executive knows little regarding the wages his men require. Almost unanimously the working man is asking for a living wage. It it no more than fair that his labor should net him a sum equal to his demands.

The shop view shown on a previous page is taken in the plant of the Lakewood Engineering Company of Cleveland, Ohio, and shows a modern way of trucking. Employees take pride in a firm which does its trucking in up-to-date ways. I have talked with truckers by this method who speak of their work with pride, while those pulling a hand truck barely will mention it.

After my quest of what the employee wants, let me say a word regarding the secret of it all. From all my questions asked the worker it will be easily seen that the installation of any factor I have mentioned will increase a man's pride in his work.

I have heard men working at the Prest-O-Lite Company, when they were walking about in town, talking about the wonderful meal for twenty-five cents. In regard to a certain Motor Company, I have often heard: "I wish I could get in there as every man must work up if he wants a job there."

I have visited employment departments, apparently seeking a job yet actually seeking how they attempted to get men and what bait they used. After it all I find that if you give a man an opportunity to work and to be rewarded for good work, he will take more pride in the company. If you give him the responsible job with the raise, and show him that the firm really has an interest in him at heart, he will usually return that interest. Don't be afraid to call him "Jack" or "Bill," and if your name is Charles, you should be proud rather than offended to have your men call you "Charlie." It is that old time grip which the men miss, and anything which will bring it about is the thing men want.

New Fields of Usefulness for the Electric Furnace

(Continued from Page 20)

nace, the heating principle is very simple. As shown in the cross-section illustration, two rectangular carborundum channels, or trough are placed one on either side of the heating chamber of the furnace. In the melting furnaces, which are circular, this trough is exactly the same in principle, but becomes a ring in the upper part of the furnace. The trough is packed with granular carbon material, and electrodes are embedded in it to connect to outside terminals, so that merely by closing a switch any desired amount of energy may be passed into the carbon material, thus developing an incadescent heat. The heat in question radiates from the side and bottom of the trough directly to the material upon the hearth, and indirectly from the top of the trough to the roof of the furnace, and deflects upon the hearth. This results in the entire hearth area being subjected evenly to a large source of relatively low temperature heat. Any desired temperature may be obtained merely by moving the control switch to the proper voltage tap, and, after this action, no further regulation of the furnace is required.

The first illustration is a typical brass foundry unit. Such a furnace holds 800 to 1000 pounds of metal, and melts an entire charge every two hours. The usual foundry furnace is of 500, 800, 1500, or 2000 pounds capacity. Larger units than these are an exception in foundry practice, because the foundryman wisely prefers to have a battery of small units, rather than one or two large furnaces, which would tie up his entire production in case of shut-down for necessary repairs.

Digitized by Google

There are more than one hundred installations of these resistance type furnaces in various American non-ferrous foundries.

The rolling mill furnace shown in the second photograph is equipped for pouring, the metal directly into rolling mill moulds. This saves an intermediate pouring, does away with all crucibles, and greatly reduces the labor required. A motor-driven casting table is used with this furnace, so that one man may tilt the furnace, turn the casting table to bring the proper mould into position for pouring, and in short perform the entire work incidental to melting and pouring the metal. Furnaces of this character are in service in the United States, Mexico, England and Japan.

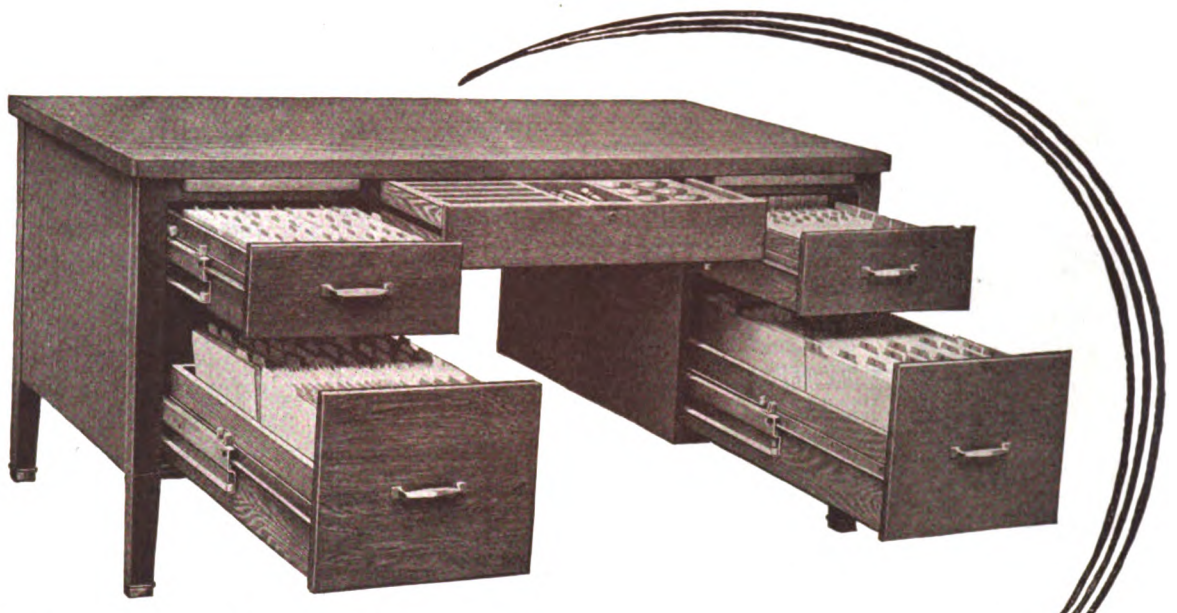
The third furnace is typical of the electric heat treating and annealing units which are becoming so common in this country. Any temperature may be obtained by these furnaces within the limits of the furnace refractories. Completely automatic equipment is furnished, which carries the material through the hardening furnace, quench and drawing chamber, without any manual operation other than the periodic placing of the material before the pusher of the first furnace. The control over furnace atmosphere, time and temperature, is absolute, and all rejections due to guess work or mistakes in treatment are entirely eliminated. To enumerate the list of products which are being electrically heat treated would require a recital of most of the kinds of steel castings and forgings which must be subjected to heat treatment of any nature.

The fourth, fifth and sixth illustrations shows an electric furnace equipment which is a radical departure from other types. This furnace is used for enamelling table tops, stove parts, refrigerator linings, signs, and other porcelain flatware, and is equally applicable to hollow ware, and any product requiring a surface of multiple coats of baked enamel. The equipment in question is capable of handling a maximum of 2,430 square feet of flat ware per hour.

A circular platform, some 200 feet in circumference, is loaded with the ware to be enamelled. The furnace travels around this platform, baking enamel as it passes. After the furnace has advanced, the finished products are removed from that section of the table, and new ware put in its place. This process continues for a full 24 hour period; workmen keeping continually ahead of the furnace, placing new ware on the table, and removing the finished material.

The furnace is in principle like a street car. An overhead trolley brings in the current to propel the car, and also the current for generating the heat to bake enamel. Any necessary temperature may be attained, perhaps as high as 1850° F. for the ground coat. The labor cost is cut in less than half. The supply of fuel is dependable at all times. There is a complete elimination of disagreeble factors as fuel storage and removal of ashes.

The furnace shown in the seventh, eighth and ninth figures is automatic equipment, designed for heat treating all



Pays for itself
in minutes saved

WHY fuss with sticking desk drawers or search through loose papers when you need data in a hurry?

Buy a desk built to suit you; a desk that's a filing cabinet, too, where you can put your hands on things *when you want them.* Note these three big advantages.

The "Y and E" Efficiency Desk

1 ***Built to suit the user*** — Six different models, every one with an especially planned record system. Let us arrange one for you.

2 ***Drawers that can't stick*** — A flip of the hand sends the heaviest drawer in or out. The "Y and E" frictionless drawer slide eliminates sticking and jamming.

3 ***A filing cabinet, too*** — The "Y and E" Efficiency Desk is a filing cabinet in itself — vertical files in lower drawers, handy compartments in center and uppers; you save the space as well as the expense of separate files.

Write for our booklet, "The Executive's Workshop," for helpful hints about office equipment.

YAWMAN AND ERBE MFG. CO.
Filing System Service, Equipment and Supplies
843 St. Paul Street ROCHESTER, N.Y.
Branches, Agents or Dealers in all principal cities
In Canada:
The Office Specialty Mfg. Co., Ltd., Newmarket, Ont.

"Y and E"

Digitized by Google

THE "OVERHEAD FALLACY"

What is "overhead expense?" The dictionaries refuse to answer. Among manufacturers there are almost as many opinions as there are persons willing to express them.

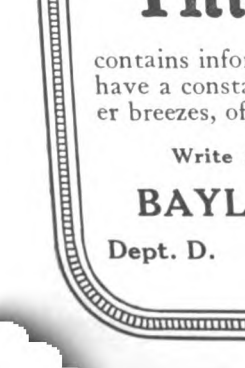
Large experience, careful observation, and consideration has convinced us that there is no "overhead" in manufacture. The term "overhead" is used by accountants, or others, to designate *en masse* the items of expense which they *no not know* how to measure into the product. *The use of the term "overhead" is an admission of ignorance.*

Dangerous Cost Systems

Any system in which an "overhead expense" group is created, and its distribution attempted, violates the fundamental principles of cost determination. Its results are unreliable because inaccurate to a dangerous degree. *Its user is fooling himself.*

The common practice of distributing either a "general factory overhead" or "departmental overhead" *on the basis of direct wages* is the greatest single cause of business failure among manufacturers. It invariably encourages the pushing of unprofitable business and discourages profitable business. *Stop fooling yourself.*

Cost Engineering is Provable



Cost Engineering (Denham Methods) is based upon a full recognition and application of the fundamental principles of cost and expense distribution. It is the only method of cost determination offered to industries which will stand a thorough analysis and meet every test that can be applied.

Cost Engineering is not cost accounting in a different guise. It is a practical science which enables the user to apply to each any every item of product the exact expenses which were involved in its production. It includes no red tape but is extremely simple.

Free Information Upon Request

The A-B-C of Cost Engineering, 116pp. cloth, will be sent *free* to any General Manager or other factory executive. Send for it. Ask for a representative also.

Address

~THE ORIGINATORS OF COST ENGINEERING~

THE DENHAM COSTFINDING CO.

· COST ENGINEERING SERVICE ·

437 Sloan Building CLEVELAND



A Breath of Rain-Washed Air

Did you EVER



open the window after a summer shower and fill your lungs with deep inhalations of pure, invigorating, Rain-Washed Air?

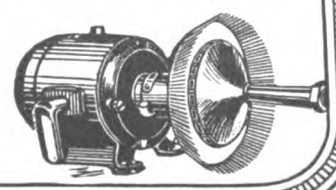
This FREE BOOK

contains information on how to equip your building so you will have a constant supply of air equal in purity to the after shower breezes, of a practically uniform temperature the year round.

Write for your copy today

BAYLEY MFG. CO.

Dept. D. Milwaukee, Wis.



sorts of automobile forgings. Since the parts treated range from crank shafts to the smallest parts entering into the construction of the car, the material is loaded into pans, which are placed on the charging platform by a motor-operated pusher. When the pan is driven into the furnace, all the pans within move on, so that the pan next the discharge door is pushed out into the quenching bath (as shown in Fig. 8). The time cycle is so arranged that the period of time necessary for the pan to pass from the charging door to the discharge end of the furnace is precisely the right time to give the material the designated heat treatment. After the material has been quenched for the proper time, an electric conveyor carries it from the quench onto the charging platform of the drawing furnace. Here the process is exactly the same as in the hardening chamber. This means that the equipment is practically "fool proof," and that the accurate heat treatment which heretofore was possible only on an experimental basis, is repeated as long as desired, no matter what the tonnage handled may be. After the desired treatment has been determined, the equipment must be set for the proper time and temperature in furnaces and the quench; after that it is necessary merely to feed the material. Since the treatment is an exact certainty and never depends upon the chance judgment of the furnace operator, all rejections due to faulty treatment are entirely eliminated. An automobile whose parts are heat treated in this fashion may practically guarantee its user against the annoyance of breakage of parts under strain.

The car type furnace illustrated in the tenth photograph is used for railroad frogs, crossings, and other castings which require for their construction the use of manganese steel. It has been the common practice with managanese steel to place the material upon the car, heat the same in the fuel fired furnace to a temperature of perhaps 1900° F., then remove the charge, and quench it immediately in water. This results in very serious breakage in the castings under this severe strain. The electric fur-



THIS TRAMP IRON

has no terrors for "Pennsylvania" Coal Preparation Machinery, which has been specialized to pick out Tramp Iron automatically, or pass it without damage.

"Pennsylvania" Bradford Breakers, for large Central Stations, Mines and Gas Works, with almost human precision throw out tramp iron, rock, bone and sulphur balls without damage to the machine and without power, labor or supervision.

"Pennsylvania" KINGCOAL Hammer Crushers, for preparing stoker sizes, are equipped with Patented non-magnetic Tramp Iron Separators and require no attention aside from occasional dumping.

"Pennsylvania" Single Roll Coal Crushers are of massive construction, provided with double Tramp Iron protection. They are designed to be forgotten by the operator.

Our Engineers study the requirements in each case and suggest the size and type of apparatus specialized to insure a continuous supply of properly prepared coal at minimum cost per ton for Central Stations, Gas Works, By-Product Coke Plants, Industrial Power Plants, Gas Producer Plants and Coal Mines.

Put your coal preparation problems up to us.



PENNSYLVANIA CRUSH

Digitized by Google

nace eliminates this difficulty, because it supplies heat evenly to all the material upon the car, and so prevents any part being heat treated too much or too little. After receiving this sort of treatment the casting is practically certain to come through the quenching without breakage, no matter how much it may vary as to the cross section of its component parts.

A new and very rapidly developing field for the electric furnace is illustrated in the eleventh photograph. This is a melting furnace utilized for precious metals, such as silver and gold. The furnace is of the pit type, and holds two No. 40 crucibles. The chief advantage of such a furnace rises from the fact that the precious metal is handled in such a manner that the danger of loss is reduced to a minimum. Mines, smelters, and refiners of England, Japan, United States, and Mexico, have installed furnaces of this character for silver melting. The largest bullion manufacturer in England uses the nose tilting type furnace similar to the second illustration, but, of course, smaller in hearth capacity. In these plants a close tab is kept on every ounce of the precious metal, and it has been found that the use of an electric furnace makes this task very much simpler. The Japanese mint uses the pit type electric furnace also for refining gold.

Another use for the electric furnace which is certain to prove popular is for the melting of ferro manganese (see Fig. 12). It is common practice in the steel foundry to have several heats coming off at the same time from open hearth electric furnaces. All of these require the molten ferro at substantially the same time, but ferro manganese being volatile cannot be held in the ordinary furnace without serious loss. The resistance furnace with its sealed melting chamber, and its non-oxidizing atmosphere prevents this volatilization, so that the alloy may be held in the molten state for long periods without material loss.

The furnace illustrated is rated at 360 K. W.'s in electrical capacity, and is capable of heating a ton of manganese steel every hour, and its car has an effective carrying capacity of 12 tons of material.

In the mnufacture of automobile body and fender stampings it is of the highest importance that the heating operations be conducted with as little scaling as possible, for any pitting, due to this action, requires considerable additional labor in getting the defects sand blasted to sufficient extent to get a good finish on the part. For this reason an electric furnace, such as the fifteenth illustration, was developed. The most interesting feature of this equipment lies in the fact that it is portable and may be moved about from one part of the hammer shop to another. This was necessary because a large part of the pressing and drawing to shape is performed cold, and only one or two hot runs are required to perhaps six or seven cold operations. The portable furnace is handled by a crane and taken from place to place, so that there are no idle furnaces while the material is receiving its cold runs.

The transformer and control equipment is located on the roof of the furnace. Flexible leads are provided which merely need to be plugged in to outlets which are located in various parts of the building. The furnace is rated at 100 K. W.'s, and has a capacity for heating 750 pounds of material to 1800° F. per hour. By the use of this furnace scaling has been reduced to an almost negligble item, and very much smoother sheets are obtained than were possible in the fuel fired practice.

The last illustration (Fig. 16) is a tilting type furnace employed in an aluminum foundry, making starting, lighting and ignition castings for automobile work. This furnace has a hearth capacity of 500 pounds of aluminum and a melting rate of 350 pounds per hour.

While in aluminum melting there is not the problem of volatilization, which is so great a factor in melting alloys high in zinc, nevertheless there is the danger that the melt will absorb injurious gases, which pit the castings, and if not serious enough to cause breakage, will at least result in very difficult machining. The sealed chamber of the electric furnace keeps out all injurious gases of every nature, and produces a metal of the highest quality, at



DOUBLE EXTRA HEAVY VALVES
"Every Valve sold With a Positive Guarantee."
"Hosts of References."

"The Heaviest Valve Made"

4100

Golden-Anderson Life and Property Insurance Valves are used in the iron and steel industry. Their repeat orders are the result of assured protection.

GOLDEN-ANDERSON
"Life and Property Insurance Valves"
Patent Automatic Double-Cushioned Triple-Acting and Non-Return Valves

1. They will automatically cut a damaged boiler out of service—making it impossible for live steam to pour back into it and cause a disastrous explosion. The other boilers are left intact, and can be continued in operation.
2. They will automatically shut off the steam flow from all boilers the moment that a pipe ruptures, thereby eliminating a pipe explosion.
3. A fresh boiler is automatically cut into the line, eliminating the serious danger involved when doing this by hand.
4. The pressure is automatically equalized between all boilers.
5. No steam can be turned into a cold water boiler, thus protecting men working inside.
6. Fitted with double Corliss dashpot which insures perfect cushioning in opening and closing.
7. No pounding, sticking or spinning
8. The only valves that can be tested in service.

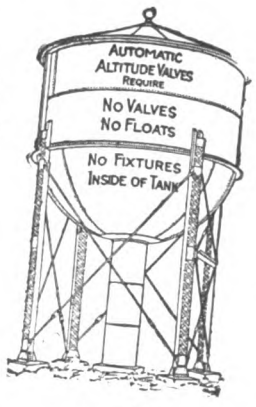
Golden-Anderson Automatic Cushioned Controlling Altitude Valves

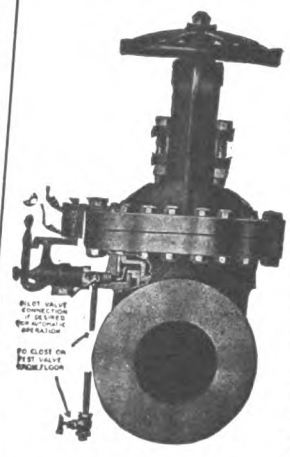


For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. Three Ways of Closing "These Valves."

1st—Automatically by Water.
2nd—By Electricity, if desired.
3rd—By Hand.

May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.





Golden-Anderson Pat. Cushioned Combined Throttle and Automatic Engine Stop Valves

Give perfect automatic control of the steam or air flow in any pipe line from one or more distant points.
Can be opened or closed instantly in case of emergency by steam or electricity.
May be tested while in service, giving complete assurance of safety.
Positively cushioned by double Corliss Dash Pot. No banging, sticking or chattering.
Contain no springs or tight-fitting parts.
Can be adapted for automatic closure in case steam pipe bursts.
Double extra heavy and virtually indestructible.

Golden-Anderson Pat Automatic Cushioned Steam Pressure Reducing Valves

Automatically hold the reduced steam pressure constant.

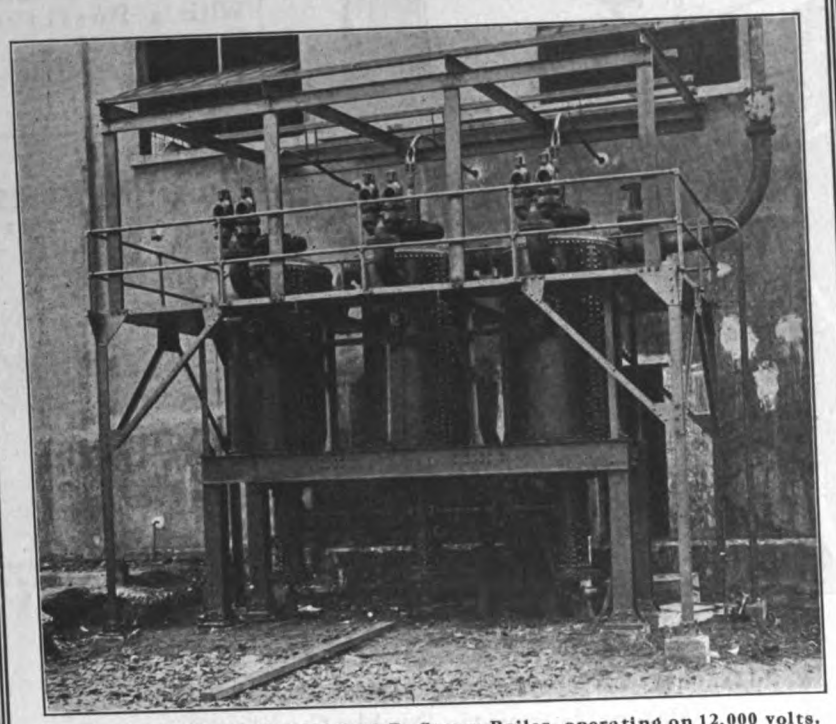
Fitted with patent safety piston that prevents high pressure escaping to low pressure side.



Golden-Anderson Valve Specialty Co.
1306 Fulton Building Pittsburgh, Pa.

Digitized by Google

"ELECTRO" Steam Generator



18,000 KW "ELECTRO" 1,800 B. H. P. Steam Boiler, operating on 12,000 volts. 3 phase, 25 cycle, evaporating 54,000 lbs. of water per hour at 125 lbs. pressure. Owned by Niagara Falls Power Co., supplying steam to the Cliff Paper Co., Niagara Falls, N. Y.
Floor space and height required: 21' x 10'3" x 22'.

Generates Steam Without the Use of Coal or Other Fuels

THE "ELECTRO" Steam Generator makes it possible to utilize a portion of the electrical current available, where high voltage alternating current is used and which in many cases is wasted a part of the day.

The "ELECTRO" generates steam by the passage of high voltage alternating current between specially designed electrodes immersed in water. Saturated steam at any pressure, can thus be delivered in a remarkably short time and the apparatus uses only a fraction of the space required by a fuel burning boiler.

The amount of steam generated, the pressure and the amount of electrical power used is under absolute control and is governed by the height of the water in the tank or the depth of immersion of the electrode in the water.

The "ELECTRO" is fully approved and sanctioned by Boiler Insurance underwriters—the whole Generator is grounded and safety is assured for the operator.

Industries located within the range of Hydro-electric power plants will find the "ELECTRO" Steam Generator particularly adaptable, because economic use can be made of the surplus energy and water.

Thus steam is generated at practically no cost—simply the cost of maintenance—and former wastes are turned into useful profitable work.

Send for further particulars of this remarkable steam generator and a list of users.

ELECTRIC FURNACE CONSTUCTION COMPANY

908 Chestnut St. Philadelphia, Pa.

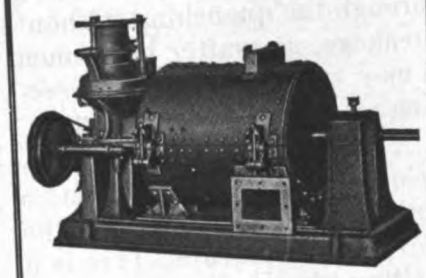
the same time greatly reducing the percentage of rejected castings, and, consequently adding to the productive capacity of the foundry.

These all are typical examples of what the electric furnace has already accomplished. What fields of usefulness it is about to enter, is a subject of universal interest. Electric melting furnaces will no doubt, some day, find wide application as large steel mixers for degrassifying molten open hearth or refined electric steel. In iron foundries, for use in connection with, or without, the use of a cupola, they may be utilized as holding furnaces, and also for melting cast iron borings. If power rates can be made sufficiently low, they may, some day, be applied to the smelting of copper and iron ores. In the glass industry electric heat will be utilized for closed pots, for single and multiple pot units holding colored glass, and also, it is predicted, that electric heated leers are bound to show a great advantage both in economy and quality of operation.

In the opposite field of heat treating and annealing, the electric furnace will probably find widest application for soaking hot ingots, re-heating billets and blooms when used in connection with fuel fired pre-heating furnaces, for annealing sheets and cold rolled stock, for the re-heating of steel bars, and the annealing of tin plate as well as for heating the tin pots. Another important development will be the electric heating of steel for drop forgings, as work at present performed with oil, at poor economy, in units which are excessively small in size.

Since the application of electricity to heating problems means the development of the maximum quality of each metal, American engineers will never be satisfied until the advantage of this ideal heating fuel are extended to every branch of industry, at a cost which will place the new fuel within the reach of all. This application, some day, will be available for every plant; whether it be the smallest foundry, which might require but a single unit; or the very largest plant, which would demand many batteries of furnaces for its work.

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway New York

Digitized by Google

The Red Trail Bridge

(Continued from Page 17)

is always comparatively young, the recurrent floods soon digging out the deposits and substituting fresh deposits at new locations. If this is correct, then the accumulations of a considerable period of years is scarcely likely to occur, except at special points. Whatever the explanation may be, the fact itself seems to be fairly clear.

The engineers took advantage of the fact and employed the open-well method of putting down the piers. However, the west shore piers, though like the others sunk by the open-well procedure were sealed in the clay in the dry. This was insisted upon by the U. S. Bureau of Public Roads.

In order that the non-technical reader may have a clear understanding of the process, it will be well to set forth briefly the general method. It is customary to construct a ring of steel or other material. This is built or placed on the exact site where the proposed shaft is to be sunk. The under side of this ring will usually be provided with an edge consisting of a single bevel. This ring is the cutting edge. In a representative case, it will have a smooth cylindrical surface on the exterior vertical part. The bevel will extend inwards and upwards from this. The character of the edge is that of a wood-worker's chisel. Above and on this ring will be constructed of concrete or other masonry a cylindrical wall. By digging round and round the edge from the inside, the cutting edge with its "well" of masonry may be made to descend by its own weight. If the soil penetrated carries water in any considerable quantity, this may give too much trouble to permit one to rely simply upon pumps. And, of course, men could not do the excavating in a considerable depth of water. Two courses are open, however. In accordance with one, the well is made air-tight and other modifications adopted, the object being to maintain a high-tension atmosphere inside. The tension of the air then is so managed as to prevent the entrance of water through the bottom of the shaft or around the cutting edge. In short, the interior is kept dry, thus permitting workmen — "sand hogs"—to dig away the earth at the bottom, and so allow the well to settle further and further down. This method keeps the workmen at the digging point. By the alternative procedure, the men are withdrawn and an orange-peel excavating bucket—or some other proper pattern—is substituted. The well is left open, the excavating bucket doing its work through water or not, as the case may require.

The compressed-air method is, within its sphere of application, perhaps the most certain of success of all shaft-sinking processes. But it is limited in respect to the depth. When 100 feet of hydrostatic head has to be blown out at the bottom of the excavation, the air tension required amounts to about 43 pounds per square inch. This is approaching the limit of endurance for the "sand hogs." When 30 feet additional have been added, the limit has been about reached. Furthermore, the method is very costly.

Consequently, engineers are apt to avoid the pneumatic method, if possible, and seek some alternative. For the piers of the Red Trail Bridge, the excavating was accomplished in the open. But not in the case of all. The government required certain work to be done by the compressed-air method.

There is one thing which happens occasionally with open piers, which is calculated to make the engineers thoughtful. The well of masonry is liable to stick tight. This is pretty sure to happen, if the well loses its verticality. Visualize conditions when the cutting edge has gotten down 50 feet or more and is surmounted by an enormously heavy wall. Suppose, now, that the whole tips, because of an excess softness of the soil on one side down under the cutting edge, or because of unequal cutting away of the soil. Not only may the whole stick;

(Continued on Page 54)

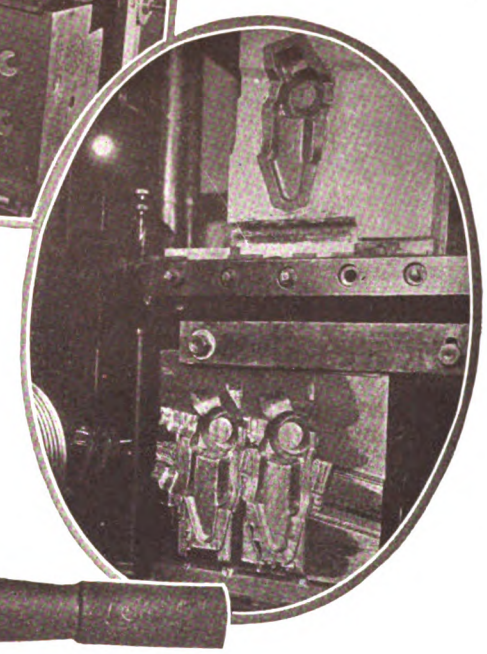
Do It Mechanically —by the Keller Method

A few illustrations showing how the *drop forger* is doing it. Modern efficiency makes hand methods obsolete.

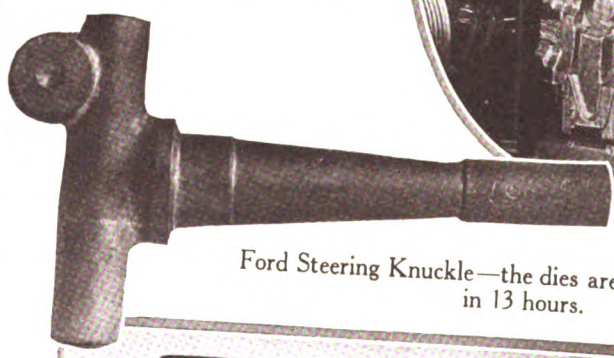
KYE



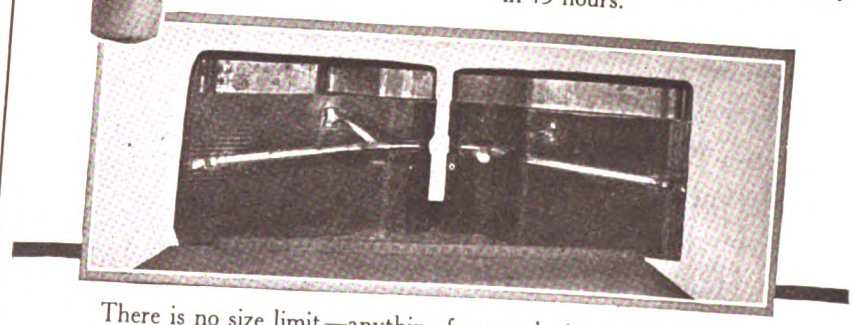
A large wrench manufacturer is cutting dies like these on a Keller Automatic Machine in eight hours.



Intricate locks and deep cutting present no difficulty to a Keller Machine. Note how it has reproduced in steel two impressions with locks and all, from a plaster pattern—working *automatically*.



Ford Steering Knuckle—the dies are cut automatically in 13 hours.



There is no size limit—anything from a clevis to a crankshaft.

The Keller method is applicable to every industry using Dies, Molds, Core Boxes and Patterns.

ASK HOW IT APPLIES TO YOU

KELLER MECHANICAL ENGRAVING CO., 58 Washington St., Brooklyn, N. Y.

Digitized by Google

(Continued from Page 53)

but it may have to be abandoned, because of an inability to right it. One such case occurred on the present job.

The piers used as foundation structures for the Red Trail Bridge were of novel design and of large size. I speak now of the piers that stand in the river. At the base, the pier is 60 feet long. This dimension parallels the current. The width is 23 feet. This base structure standing on such a site is 14½ feet high. A steel skeleton was erected on the cutting edge. To this frame forms were attached, and the whole filled up with concrete. Reinforcement was provided at suitable points. Pockets, three in number, were left in the base structure, in order to provide for the excavating buckets.

The cutting edge itself had a bevel of 40°. The pier design is narrow above this base. Thus, above the base line, the pier narrows first to 16 feet, then to 12 and finally to 10. This last width is in fact the diameter of the two great pillars which constitute with an arch, the upper part of the whole structure.

The shore piers consists, each, of a pair of twin columns having a diameter of 20 feet. They are 10 feet deep and are provided with a dredging pocket having a diameter of 9 feet.

The putting down of the piers went along rather briskly at first. That is, they penetrated downwards at the rate of from 1 to 3 feet per day. When the clay stratum was reached, however, there was more or less delay because of the sealing of the piers.

The reason for sealing was this: The clam-shell excavating buckets employed were unequal to the work of digging this clay stratum satisfactorily. The substitution of men working at the point of excavation meant that the water had to be excluded. This was done by sealing. In order to carry out the sealing, it was found necessary to penetrate the clay some 10 or 15 inches. This was required be-

(Continued on Page 55)



Temperature Instruments

In home or office, in the city or on the farm, in laboratory or factory, on land or sea, at high altitudes or in mines below the earth's surface, there's a *Tycos* or *Taylor* Temperature Instrument for every purpose.

Industrial Straight and Angle Stem Thermometers; Self Contained Recording Thermometer; Mercury Recording Thermometer; Refrigerating Engineers Testing Set; Engraved Thermometers; Hydrometers; Air Compressors; Mercury Column Vacuum Gauge; Mercury Column Absolute Pressure Gauge; Dairy Thermometers. A catalog awaits your request if you specify your industry.

Taylor Instrument Companies
Rochester, N.Y. U.S.A.
There's a Tycos and Taylor temperature instrument for every purpose

8-312

Just Suppose--

You had coming to you every month
A big bunch of Pictured Progress
Such as you see in this copy of
Industry Illustrated

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name.....

Mailing Address.....

Company..... Position.....
(Important confidential information—for our own records only)

ANNUAL SUBSCRIPTION $1

In Canada, $1.25; Foreign, $1.50

Digitized by Google

(Continued from Page 54)

cause the surface of the stratum was not precisely level all over, but had irregularities.

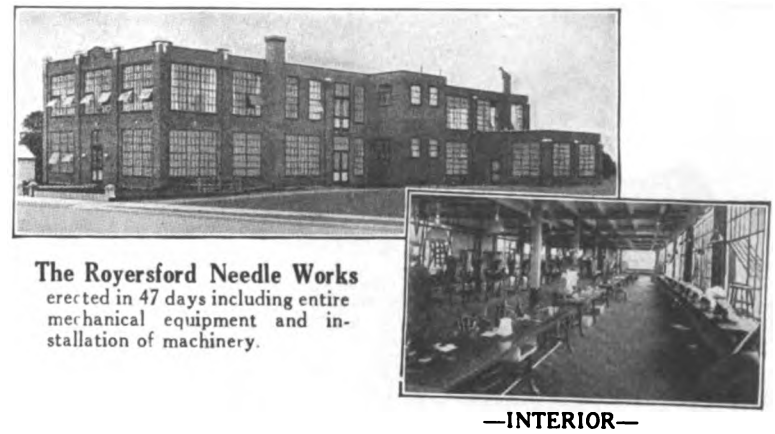
The difficulties brought about by moderate inequalities were accentuated in the case of Pier No. 3. The upper surface of the clay was found to dip. In consequence, this pier, when at a depth of 70 feet, tilted over a matter of 30 inches. In order to loosen up the clay on the high side, driving points made from old steam-boiler tubes were employed. The blacksmith closed these tubes at one end. They were then driven into the clay, and into the holes thus made dynamite cartridges were inserted. These were shot, a number at a time. After the several piers had sufficiently entered the clay to make dryness possible, and had been duly sealed and the water pumped out, excavation was resumed. That is, workmen down in the hollow piers continually dug away the stiff clay with mattocks.

The shells constituting the piers at first were constructed of reinforced concrete and made sufficiently strong to resist compressed air, in case it should become necessary during the sinking to have recourse to the pneumatic method. This procedure has already been partially explained. It may be as well to supplement the incomplete explanation.

New York City for example is so situated, particularly near the lower end of Manhattan Island, as to require excavation through water-bearing strata — sometimes through quicksand. It has become usual during recent years to carry the foundation of all very tall buildings to the bed-rock. Where water and quicksand are to be dealt with, a common practice is to use the pneumatic method. All the piers of the Singer Tower are on rock. The Municipal Building is partially on rock, partially on something else. The rock was too far down—and I understand the foundations cost $1,000,000 as it was. A kind of cabin is made on a cutting edge. That is, there is no bottom, but there are strong sides and roof. The roof is pierced and round this opening a "well" rises to the surface. An air-lock is secured to the top of the well, which may be of steel. Concrete is put round this well and thus gives weight and body to the structure. The concrete stands on the roof of the caisson, as the "cabin" is called. The man and the tools pass down through the air-lock and the men and the "spoil" pass up through the same device. When the excavation is quite finished, the interior of the caisson and the pasage-way are filled up with concrete. It was once the custom to leave the wooden caisson in. This was objectionable, because of the wood. Later, the caisson was constructed of reinforced concrete. It was thus suited to become part and parcel of the solid pier. If I am not mistaken, the piers put down for the Municipal Building, New York City, were the very first or among the very first where the caisson was itself of concrete.

To return to our Red Trail Bridge, however; the great piers out in the river are enormously strong and substantial. There is the great base, the two massive columns rising from it, and the arch connection joining the upper parts of the columns. All these constitute substantially a simple piece of masonry. There is reinforcement where needed, so that tensile strength is supplied at various points.

In the older days—that is, from about 1880 on to the end of the nineteenth century, the War Department required that bridges should, in the interests of navigation on the Upper Missouri, have a clearance of 50 feet above the high water level. This requirement, had it been insisted upon, would in the present case have constituted a very onerous requirement. The bridge would have had to be unnecessarily high and this would have added to the cost. As a matter of fact, however, the 50-foot requirement has become an archaism. It was conceived in the days when the river boats had high smoke stacks. Today, it appears that the only type of vessel that can expect to compete with the railroad and the motor truck is one that depends upon internal combustion engines. The



The Royersford Needle Works
erected in 47 days including entire mechanical equipment and installation of machinery.

—INTERIOR—

Save By Building Now!

UNDER the Beling-Bush Method of Standardized Construction we can erect your building in from 30 to 90 days. You save on plans and specifications. Constructions costs are now low and, with America entering into greater building activity, now is the time to build while costs remain low.

Let us help you on your next building. Write for information and catalog.

THE BELING-BUSH CO., INC.
FACTORY ENGINEERS AND BUILDERS
Drexel Building Philadelphia, Pa.

THE SERVICE

"It's an *old broom* that sweeps clean"



That old adage of the "new broom that sweeps clean" has been paraphrased as above where LAY BROOMS are used.

LAY
Stapled Metal Case
BROOMS

assure the greatest economy. *They wear to a stub,* and sweep clean while they do it. Every broom is backed by 44 years experience in the manufacturing of brooms and brushes. Every broom is guaranteed unconditionally.
Their lasting qualities are due to the stapled metal case and machine-made feature which is a decided advance in broom making.
We manufacture brooms and brushes to fit any industrial requirement. Sign the coupon below and mail it in today. We will recommend the types most suitable for your work.

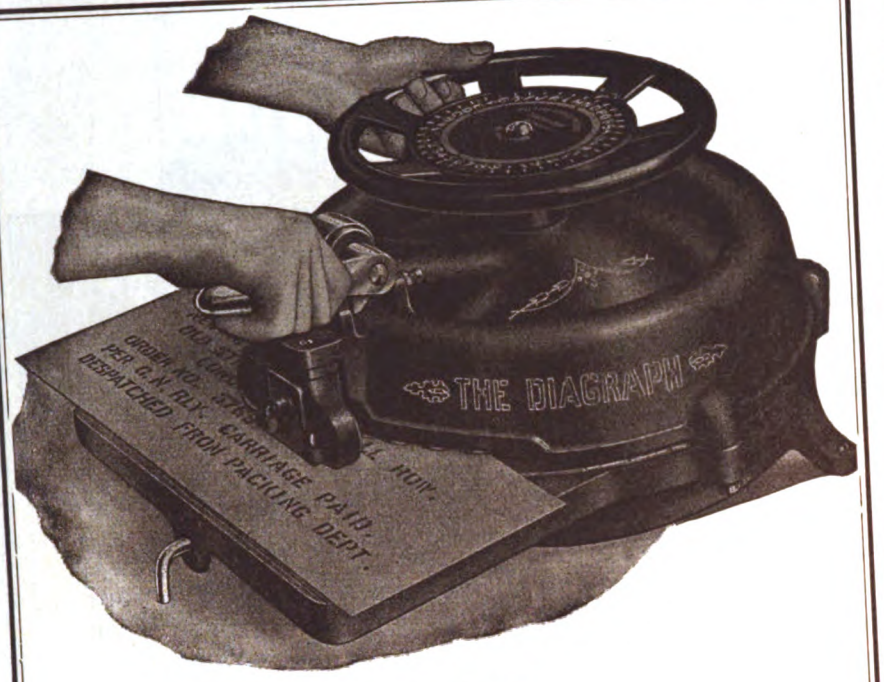
METAL CASE BROOMS
Bench Brushes Casting Brushes
Street Brooms Hickory Fibre

The Joseph Lay Co.
Incorporated
Grant and College Street
Ridgeville, Indiana

Please send information regarding the brooms most suitable for the following:
Floors — Wood, Concrete, Brick, Composition, etc.

Name .....
Company .....
Address .....

Digitized by Google



READ
"The Freight That Failed"

By Forrest Crissey

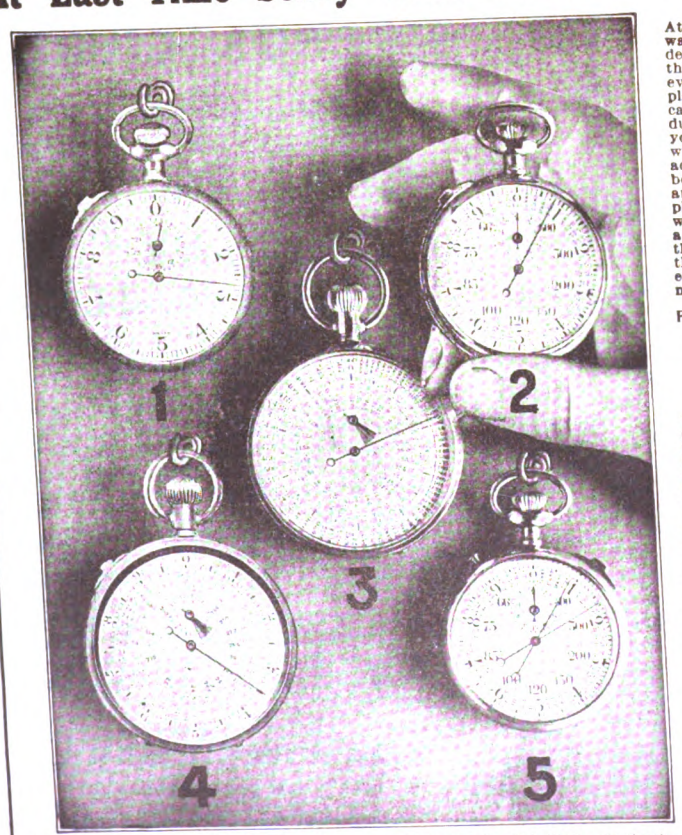
Every business man should read this illuminating article in the May 27th issue of The Saturday Evening Post. Mr. Crissey, in discussing the $100,000,000 annual freight claim losses, states that the use of stencils for addressing is a highly effective means of loss prevention. Read Mr. Crissey's article—then buy a Diagraph. Free trial in your own shipping room.

DIAGRAPH STENCIL MACHINE CORP.

1626 So. Kingshighway Blvd., St. Louis, Mo.

Branches in all principal cities—see phone book.

At Last Time Study Watches for Every Job



At last time study watches have been developed to where they can apply to every job in the plant—do their own calculating for production figures—give you direct results with absolute accuracy. Your job may be a simple time analysis—or a complex problem in piece work rate setting or a bonus system—there's a watch in this illustration that exactly fits your needs.

For Locating Wastes
Computing Costs
Setting Rates for Piece Work
Establishing Bonus Plans

You can use any one of these watches for every kind of time study. But each has special features that facilitate certain types of work. No. 1 has a plain decimal dial with the "take out time" feature. No. 2 has, in addition, direct readings in production per hour up to 1 minute jobs. No. 3 carries the same readings up to 5 minute jobs, in seconds and half-seconds. No. 4 gives all readings in decimals and shows production figures up to 3 minute jobs with a special arrangement for timing jobs up to 30 minutes. No. 5 is the "split hand" watch with the "take out time" improvement which now permits careful studies of multiple operations and parts of operations. Each watch has this "take out time" feature.

Any Watch Sent on Approval to Responsible Concerns

Pick the watch that fits your job. We will gladly send it with a descriptive pamphlet on its use to any responsible concern on approval. Put it to any test you wish—prove its advantages in facilitating the work and guaranteeing absolute accuracy. Each watch is backed by our unlimited guarantee. Write us today for the instrument that fits your requirements—or in case you desire our advice, tell us the class of work you are doing and we will ship you the watch to meet your needs. No obligation. Write today for detailed pamphlets, or for pamphlet entitled "More Jobs for the Factory Stop Watch."

MORTIMER J. SILBERBERG CO.

Peoples Gas Bldg. Pioneers in Manufacture and Sale of Time Study Watches **Chicago, Illinois**

requirement was cut down to 38 feet and might probably without risk have been cut still lower.

The Red Trail Bridge has a feature that is more or less unusual in connection with American steel bridges. About the close of the nineteenth century or the beginning of the twentieth, there was, it seems, some difference of opinion between American and European bridge engineers in respect to the question whether a pin-connected system of steel-work or a rivet-connected system was the more economical. The Americans claimed the pin-connected bridge was preferable from this point of view and the Europeans claimed the rivet-connected. It would appear as if the Americans were able to build a lighter bridge with pins than the Europeans with rivets. However, in the present case, the American engineers have used the rivet-connected system, and claim that they have produced a bridge that is more economical in respect to weight of metal than if they had employed the pin-connected system. A feature of the design of the trusses of the big spans is an attempt to approximate equilateral triangles in the arrangement of the members. Those who cross the bridge by automobile or otherwise may care to note this feature. It is also evident from one or more of the views shown herewith.

A rather unusual attitude has been taken by Capt. I. P. Baker. This gentleman is principal owner of the only company handling real commercial transportation on the Upper Missouri. Nevertheless, he is an ardent promoter of the bridge enterprise, having been active in getting the reduction of the 50-foot clearance requirement and having donated a good deal of land for the bridge. He takes the broad view that the better connection there is between the developments on the two sides of the river the more business his company will have.



One of the 183-foot towers supporting the antenna of the General Electric Company radio broadcasting station, erected on the building where the powerful transmitting apparatus is located. Photograph by General Electric Co.

Digitized by Google



Showing the manner in which belt conveyors can be installed. Note the conveyors hung from ceiling as well as conveyor to the right placed on floor.

Why Did The Diamond Match Company Equip Their Plants with Conveying Systems?

Because they realized that efficient handling of the raw materials entering into their finished product through the various operation stages meant increased production.

Production of a product has its inception the moment raw materials are received and is not completed until the finished product is in shipping room.

Raw materials, products in various stages of completion and the finished product should be handled mechanically in order that production be increased.

A conveying system to be efficient must be designed to conform with individual requirements. Your method of manufacture must be studied carefully in order that the proper system can be developed.

We will gladly have one of our conveyor engineers call and make a survey of your handling problems. Write us at once. This service does not obligate you in any manner.

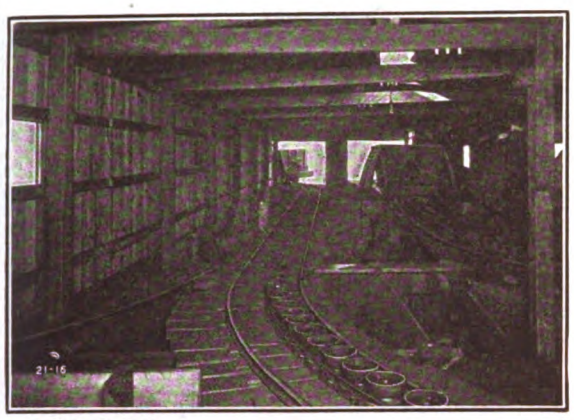
SAMUEL OLSON & COMPANY

2428 Bloomingdale Ave.
CHICAGO, ILL.

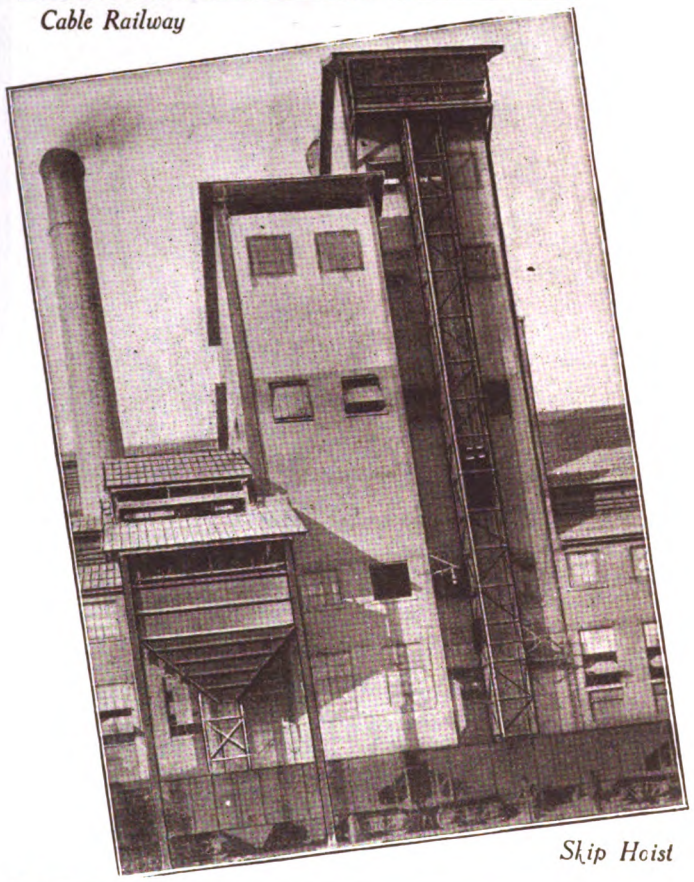
200 5th Ave.
NEW YORK, N. Y.

Digitized by Google

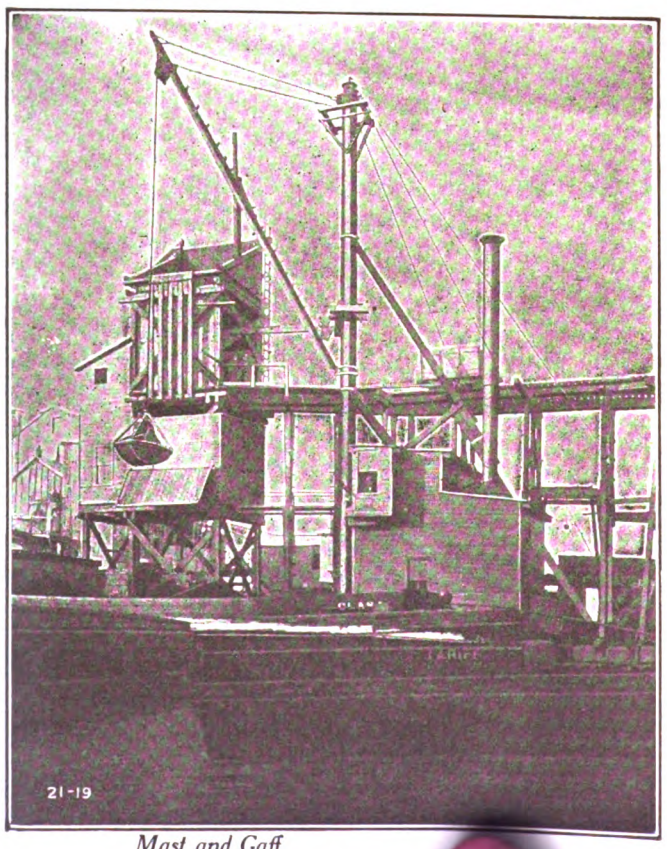
CONVEYING HUNT APPARATUS



Cable Railway



Skip Hoist



Mast and Gaff

FOR a half century Hunt Conveying Apparatus has lightened the labor and reduced the cost of handling materials in bulk.

In that time, many of the largest power and industrial plants in this country and abroad, have profited by the apparatus we have installed, and by the soundness of our advice regarding the type of equipment.

On this page is depicted five distinct types of labor aiding and time saving equipment: made for the specific purpose of handling rapidly and economically a wide variety of bulk material.

HUNT CABLE RAILWAY

For handling coal and heavy material, from point to point. Used extensively in conveying coal from barge to storage bins. Standard gauge 21 ½ inches; curve radius 12 feet.

HUNT SKIP HOIST

Applicable to many material-handling problems. The automatic operation is controlled by the pressing of a button which sets in motion the elevating machinery drawing the bucket to the top of the tower, where the load is automatically dumped and the bucket descends. The picture shows two skips handling coal and ashes.

HUNT MAST AND GAFF

The simplest and most economical method of handling bulk material from barges. Easy to install; low in first cost; maintenance and operating costs at a minimum. Electrically or steam operated.

HUNT ELECTRIC MOTOR CARS

Rapid, rugged, reliable vehicles for transporting bulk, bagged and cased material. Single and double truck drives; built to operate on third rail and single and double overhead trolley systems. Operate on 12′ 0″ radius curves.

HUNT WEIGHT LARRIES

Built to meet existing conditions with one way bifurcated chutes, to serve a single or double line of stoker hoppers. Accurate records of coal consumption registered on cards. Manually or electrically operated, either from boiler room, floor or cab.

Let our engineers study your conditions and submit recommendations that will help put your plant on a profit producing basis—no obligations to you.

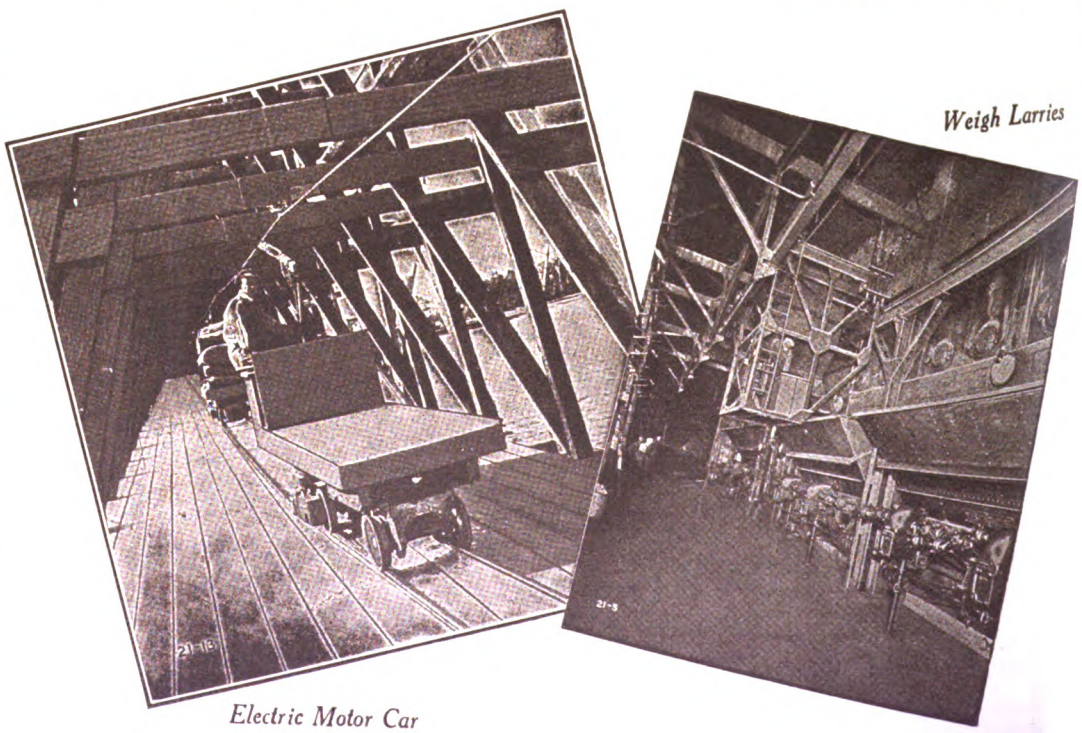
C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, NEW YORK

New York Office, 143 Liberty Street.

Ernest F. Learned
141 Milk St., Boston 9, Mass.

Philips, Long & Co., Inc.
538 So. Dearborn St., Chicago, Ill.



Weigh Larries

Electric Motor Car

Digitized by Google

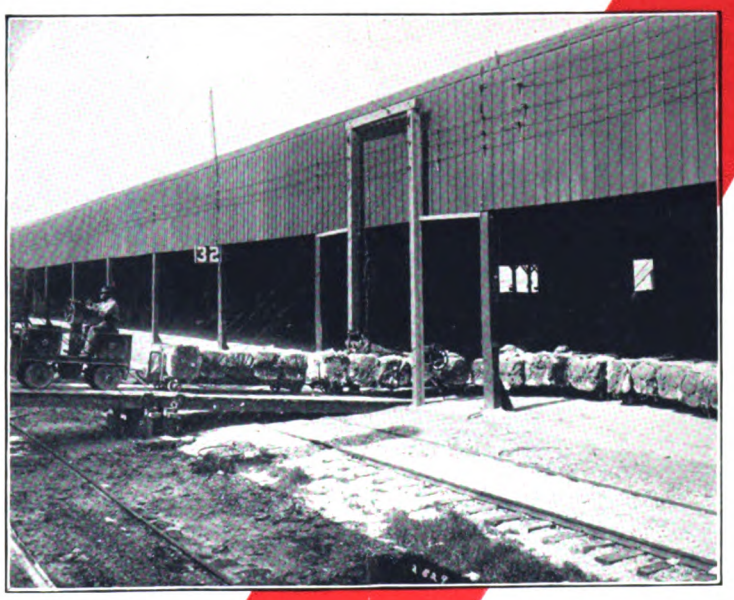
Saving $70,000 a Year—Handling Cotton On Hyatt Bearing Lakewood Trailers

Seven men, including the tractor operator, handle 900 bales of cotton in a 9 hour day between warehouses and compresses at the Shipside Density & Compress Company, Galveston, Texas.



The average haul is 1200 ft. Without the help of Lakewood tractors and Hyatt equipped trailers, twenty-five men would be required for this same work. The saving is approximately $65.00 per day per press, a total of $70,000 per year.

In addition to hauling cotton between compresses and storage, tractors and trailers are used to haul bales from one pier to another, a distance varying from one-half to one mile. This has eliminated drayage charges and reduced the cost approximately $50.00 on the hauling when this transfer from one pier to another is necessary.



Such worth while savings in the cost of moving materials require dependable equipment—trailers that stand up under continuous service for years without repairs. Hyatt roller bearings are logical parts of such trailers as these—they're durable, they're easy running, they reduce lubrication bills.



Wherever you find material handling at the lowest cost per ton you'll also find Hyatt roller bearing equipment.

Put your haulage equipment on the same dependable, economical basis—don't be content to struggle along with ordinary trailers—specify that yours be Hyatt equipped.

Hyatt Roller Bearing Company

Industrial Bearings Division

New York, N. Y.

Tractor Bearings Division, Chicago
Motor Bearings Division, Detroit

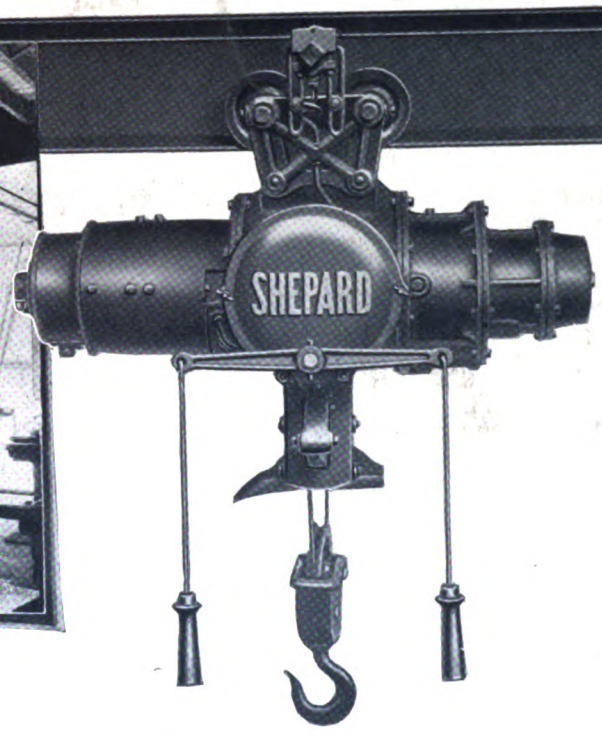
Pacific Coast Division
San Francisco

Digitized by Google

THE SHEPARD ELECTRIC LIFTABOUT

A new and smaller Electric Hoist





ONE LIFTABOUT-*that's all*

LIFTING, carrying, and putting down portable garages may be an unusual job—but it has proved simple and easy for a *LiftAbout*.

Speed—safety—low cost were the requirements of this manufacturer; and they were provided when the *LiftAbout* was installed.

(1) The *LiftAbout* picks up a completed garage section; (2) conveys it on I-Beam track over roof to edge of one story building (3); and (4) lowers it safely (5) into waiting truck.

This is but one example of the adaptability of a *LiftAbout*.

It is really a hoist for everybody's load-moving and lifting jobs, and is being used in practically every industry and business.

It has lowered production and distribution costs for hundreds. The same economies are possible for you.

The *LiftAbout* story is told comprehensively in our bulletin. Send for it.

SHEPARD ELECTRIC CRANE AND HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.

Branches in Principal Cities. Member Electric Hoist Mfrs'., Assn.

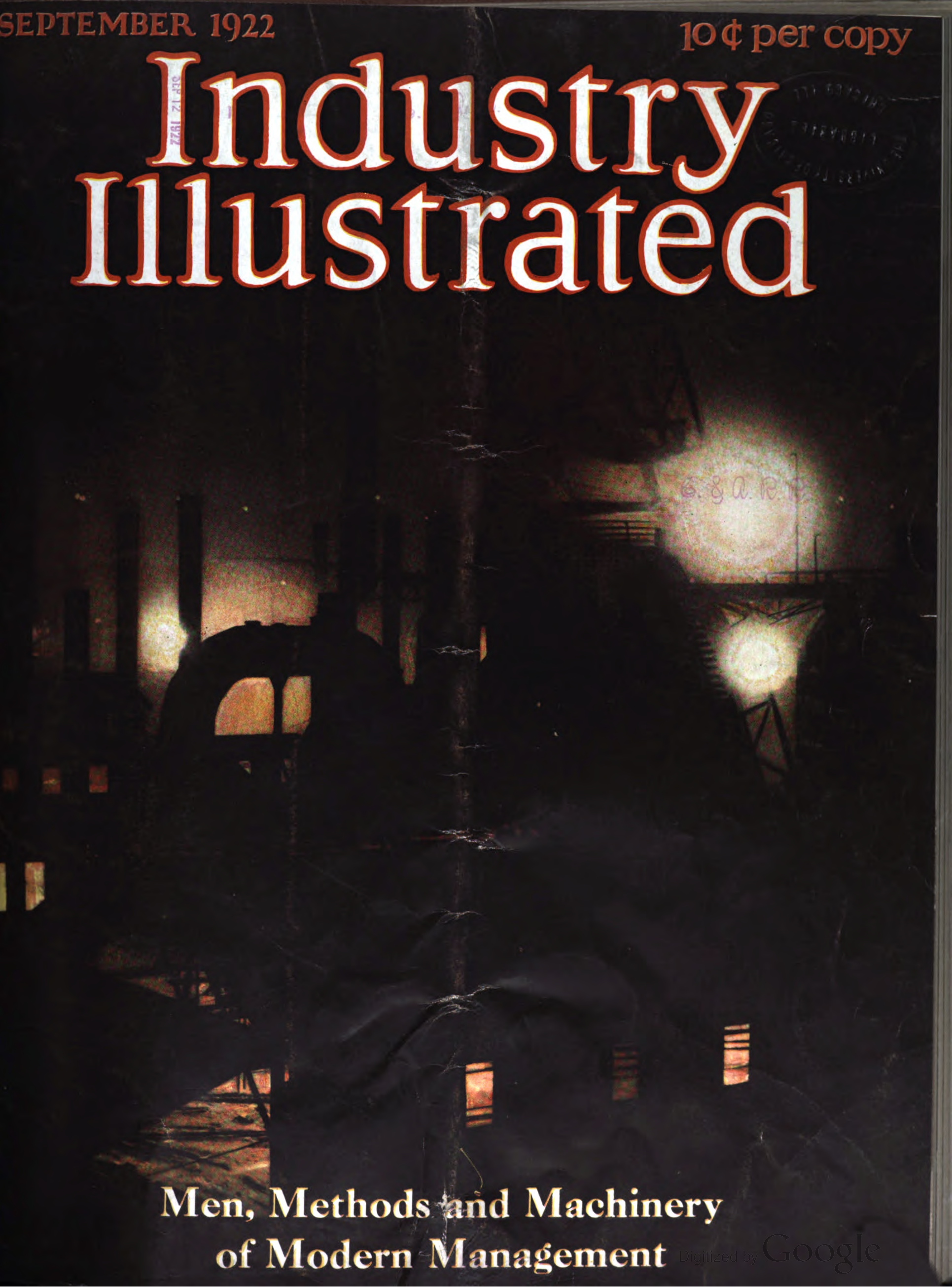
SHEPARD
ELECTRIC CRANES & HOISTS

SEPTEMBER 1922

10¢ per copy

SEP 12 1922

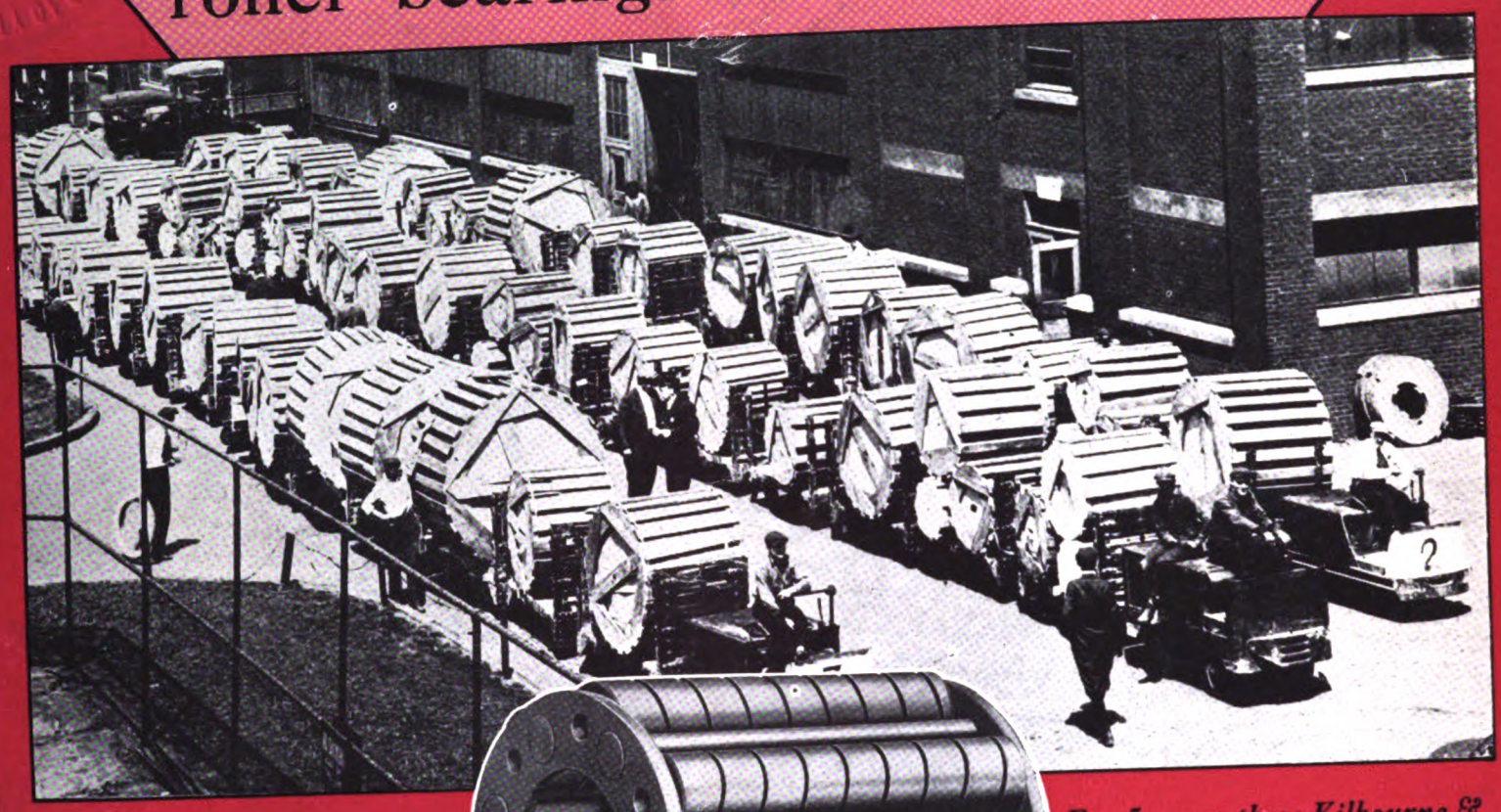
Industry Illustrated

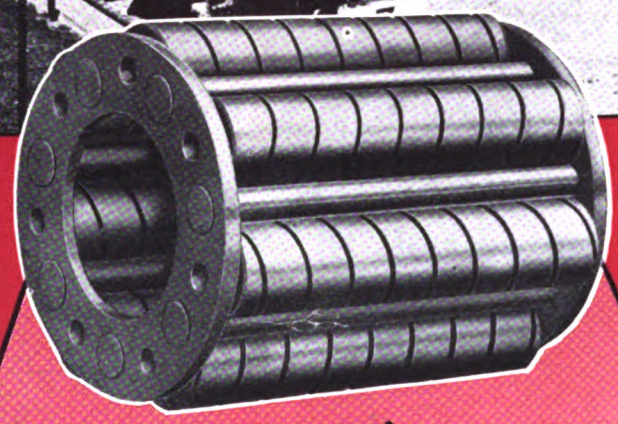


Men, Methods and Machinery of Modern Management

Digitized by Google

The use of trailers equipped with Hyatt roller bearings will assure you:





For 5 years these Kilbourne & Jacobs Hyatt roller bearing equipped trailers have been dependably carrying their 7,000 lb. loads sixteen hours a day at the B. F. Goodrich Company, Akron, O.

Decreased maintenance

More trailers per tractor

Heavier loads—higher speeds

Lubrication costs decreased 80%

Dependable operation at all times

Elimination of storage battery strains

Real saving in cost of handling every ton

Hyatt Roller Bearing Co.

Motor Bearings Division, Detroit
Tractor Bearings Division, Chicago

USE HYATT BEARINGS ON YOUR LINE SHAFTS TOO BULLETIN 127

Industrial Bearings Division

New York, N. Y.

Pacific Coast Division
San Francisco

Digitized by Google

SEP 12 1922

INDUSTRY ILLUSTRATED

CONTENTS

September, 1922

Editorial—Who Pays the Bill? Page 7

The Evolution of Anti-Friction Bearings 8

By Philip C. Gunion.

Harnessed Mountain Energy Harvesting the Mountains' Crop 11

By Arthur W. Ford—Hydro Electric Power Applied to Lumber Operations.

Night in the Steel District 12

The Angry Red Glare that Means Tonnage.

Getting One Hundred Cents Out of the Power Dollar 14

Sand—a Magic Substance 18

By Robert H. Moulton—The Many Uses that Make a Well Known Material Indispensable to Industry.

Speeding Production with Mechanical Conveyors 20

Some Dollar-Saving Ideas for the Plant Manager.

Mahogany—King of the Jungle 22

By H. F. Lee—Picturesque, but Wasteful Methods that are Responsible for the Dwindling Supply of this Rare Wood.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.,

Founded 1891 by

JOHN R. DUNLAP
Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — WALTER IVES, *Vice-president* — RUTLEDGE BERMINGHAM, *Vice-President* — JOHN R. DUNLAP, JR., *Secretary-Treasurer*

Vol. 3, No. 3. Subscription price $1.00 per year; single copies 10 cents. Copyright, 1922, by The Engineering Magazine Co., in both the United States and Great Britian. Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google



From "Here to There" Without Rehandling

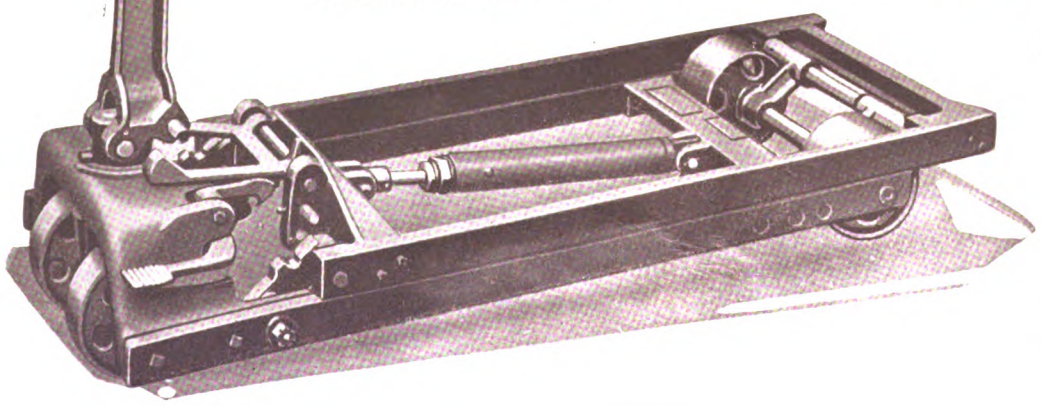
No need to load and unload goods and materials at each transfer from point to point. Rehandling of loads is wasteful in time and labor.

Many dollars are saved annually through the use of Cowan Hand Lift Trucks and Skids in handling loads. For example:

In the machine shop of a prominent New York manufacturing plant, steel worm shaft castings go through eight progressive steps of manufacture without any rehandling from step to step. In the same shop electric switchboard controllers go through three departments, from assembly to shipping platform—but no rehandling. These loads are carried on skids and are picked up, hauled, and put down by one man with a Cowan Hand Lift Truck.

Just as easy to place your loads on skids as on the floor. No gang needed to load and unload materials moved on skids. One man, with a single downward movement of a Cowan Truck handle, picks up skidded loads weighing hundreds of pounds. Roller-bearing truck wheels make hauling easy. Pressure on truck foot pedal lowers skid and load to floor without shock or jar.

No matter what your loads may be—boxes, bags, bundles, sheet or rolled materials, castings, lumber, etc.—they can be handled with Cowan Hand Lift Trucks and Skids. A Cowan representative will gladly give you complete information or we shall be pleased to mail a catalog.



COWAN TRUCK COMPANY
6 Water St., Holyoke, Mass.

N. Y. Office: Grand Central Palace

Offices in Principal Cities

✦

Hand and Electric Lift Trucks, Electric Load Carrying Trucks, and Electric Tractors

2651-N

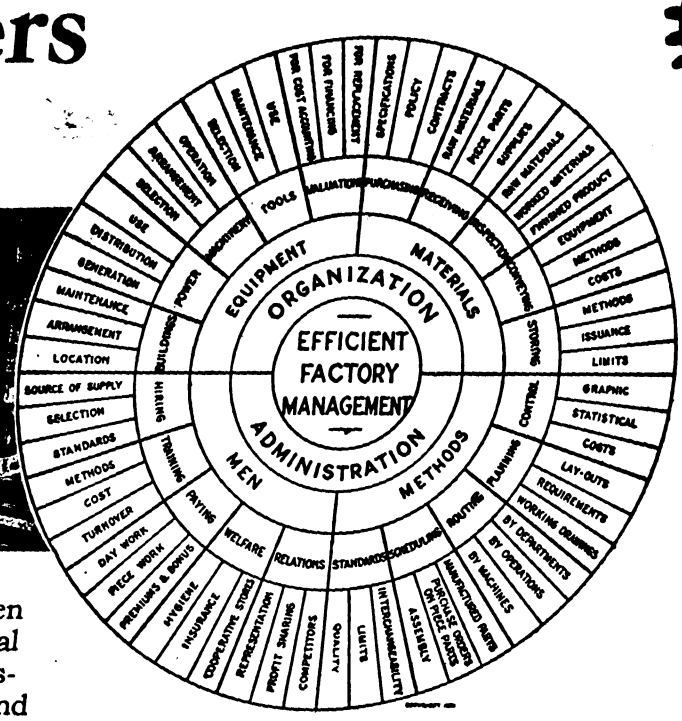
COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

Digitized by Google

If the Managers Should Strike





The words "Capital and Labor" are on everybody's lips. To hear people talk you might suppose that these two economic groups constitute the only factors necessary to the successful prosecution of an industrial enterprise.

You don't hear much about the third, and equally important, party to any industrial undertaking, "Management." And yet without "Management," neither Capital nor Labor could function successfully. If the managers should go on strike, the wheels of industry would first slow down, and then stop altogether. Production would cease. The world would starve, as Russia, which has rid herself of her managing class, has been starving.

Managers are Scarce

Capitalists can always be secured to back a manufacturing enterprise. Laborers can be had aplenty to do the work. But managers—men who have the brains and the training to plan and carry on a great industrial undertaking—managers are hard to find. There is a serious shortage of executives in industry.

What's the answer? What does the shortage of managers mean to you?

Creating Managers

The answer is that we must create more executives—that we must train more men in the fundamental principles of Industrial Engineering and Management.

And to you, if you are an ambitious man, eager to work your way upward, this shortage in managerial material means your opportunity to qualify for an important executive position which carries with it substantial financial rewards.

Prepare at home

The demand is there. Prepare yourself to fill it. But, how?

The Industrial Extension Institute specializes in training men to become industrial managers through the medium of the "Factory Management Course and Service."

Sixty of the nation's leading industrial specialists, men like Gantt, Towne, Steinmetz, Ficker, Babson, Going, etc., have cooperated to produce this course. It is based on the university plan of study and consists of lectures, talks, textbooks, reading assignments, problems, and model solutions to these problems together with a free consulting service, designed to help students apply the principles of modern productive management to their daily work.

The course trains a man in the basic principles that govern factory organization and administration, the layout of buildings and equipment, the planning and routing of work, wage systems and bonus plans, industrial cost finding, executive statistical control, etc. etc.

Best of all, it is a practical course, written by practical men, for practical men. Right now hundreds of executives and employees in such great organizations as the du Pont company, International Motors Corp., the General Motors Corp., Johns-Manville Co., U. S. Aluminum Co., etc., etc., are enrolled in the "Factory Management Course and Service."

We have a 100-page illustrated book entitled "Thinking Beyond Your Job," which tells the whole story of the "Factory Management Course and Service." It has started men on the road to greater earnings and greater happiness. Tear off the coupon below and send for it. It is free.

Industrial Extension Institute
Nine East 45th Street
New York City

Send me "Thinking Beyond Your Job" without obligations.

Name.....

Home Address.....

City and State.....

Position.....

I.M. 9-22

Executives who are interested in developing the managerial possibilities of their subordinates and who are keen to broaden their own knowledge of Industrial Management will find the "Factory Management Course and Service" especially valuable.

The Only Complete Course in Industrial Management

Digitized by Google

THE MOST ECONOMICAL AIR COMPRESSOR AND VACUUM PUMP

NASH HYTOR

THE HYTOR COMPRESSOR is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

The rotor, the only moving part, is cast in one piece, the blades being rigidly reinforced by shrouds. The rotor is mounted on a short, stiff shaft supported at each end by the highest grade annular ball bearings mounted outside of the casing.

As the peripheral clearance is large, there is no possibility of the ends of the rotor blades coming in contact with the casing.

The original high efficiency is maintained indefinitely in continuous service.

The air is thoroughly washed during compression and contains no oil.

Hytor compressors occupy very much less floor space and are much lighter in weight than reciprocating compressors. They run without vibration.

The cost of installation is greatly reduced as no expensive foundations are necessary.

No expert attendance is required as there are no adjustments to make. The cost of upkeep is negligible.

Hytor compressors are quiet in operation.

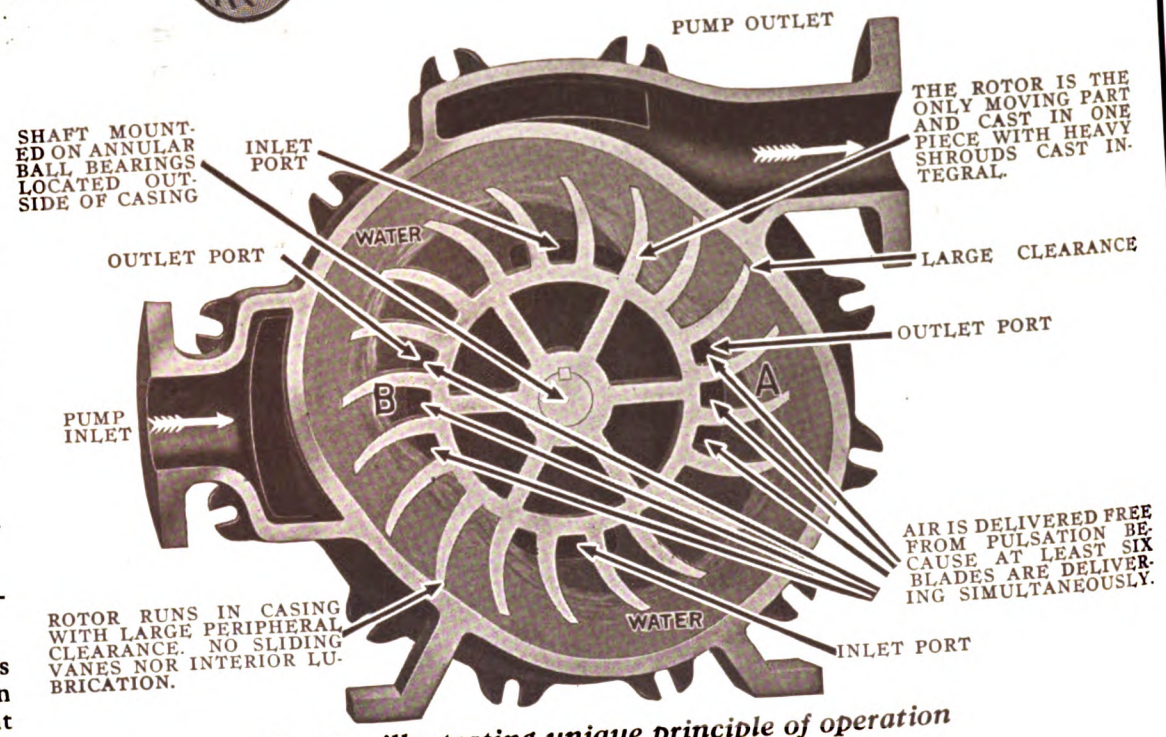
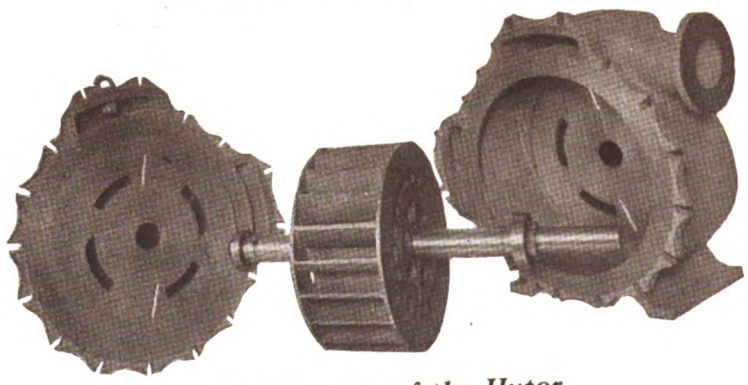


Diagram illustrating unique principle of operation



All the parts of the Hytor

A ROTOR in hydraulic balance revolves freely in an elliptical casing filled with water. The water, turning, with the rotor, and constrained to follow the casing by centrifugal force, alternately recedes from and is forced back into the rotor, twice in a revolution. As the water recedes from the rotor it draws in air through the inlet ports. When the water is forced back into the rotor by the converging casing, the air is first compressed and then discharged through the outlet ports.

This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.



6

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

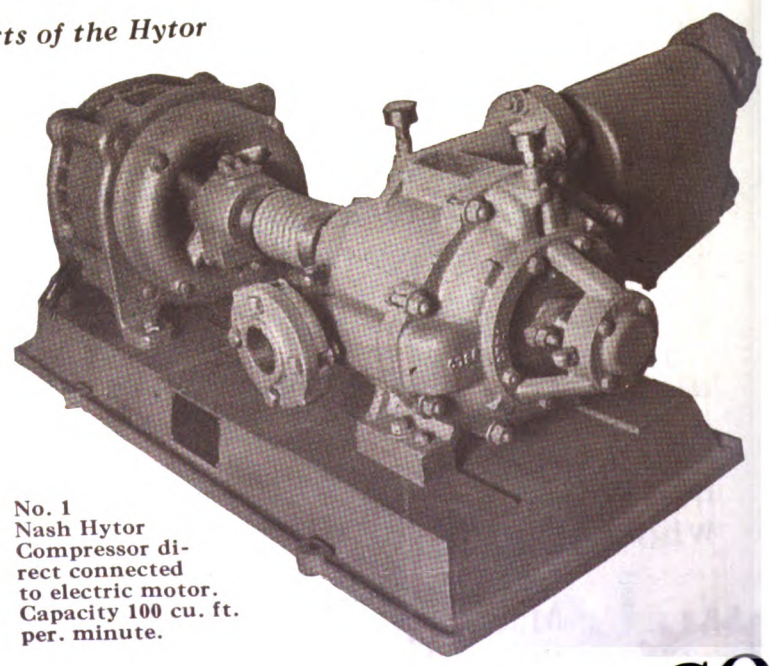
- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps
- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps

NAME.....
POSITION.....
COMPANY.....
ADDRESS.....

At pressures up to and including 15 lbs. per square inch, and vacuums up to 20 inches of mercury, the Nash Hytor affords the simplest and most economical means for handling air or gas, for all of the usual purposes where air under pressure is required, and they can be used on many special services for which the ordinary compressor is not adopted.

It is common practice in handling mildly acid vapors to re-circulate thru the pump an alkaline solution for the protection of the cast iron structure of the pump. In handling chlorine gas, concentrated sulphuric acid is re-circulated.

Air handled by the Hytor is delivered absolutely clean and free from dust or oil; a great advantage in the agitation of good products or in absorption processes where diffusion of air is accomplished by blowing thru filters, porous blankets or small orifices.



No. 1 Nash Hytor Compressor direct connected to electric motor. Capacity 100 cu. ft. per. minute.

NASH ENGINEERING CO.
SO. NORWALK, CONN. U.S.A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

Who Pays the Bill?

IN CHINA, coolie laborers can be hired for one cent an hour—ten cents for a ten-hour day. In many parts of that country coolies are the only source of power; there being no development of water power, no steam boilers and engines, except in a very few of the more progressive sections.

Naturally, in a progressive country like ours, we look down rather tolerantly upon the slow, wasteful, costly methods employed in the Land of the Dragon. We have even pointed with pride to the fact that it takes some thirty-seven "coolie-power" to produce one horsepower, at a cost of over $1,300 a year—as compared to a cost of little more than $60 a year for one horsepower produced by American methods.

Among other things discarded by the more enlightened races, the Chinese have retained the guilds. One of these guilds—that of the tea and silk packers—found, early this year, that they were not getting enough money for their work in proportion to their increased living cost. But with this knowledge, they had also the novel and refreshing conviction that their work was too important to a great many other people, to allow of its being interrupted.

In this situation, where the obvious remedy would have been a strike to focus attention on their troubles, the tea and silk packers' guild turned instead to advertising. By means of paid space in the newspapers, the guild told its patrons just why these workers should be paid more for their work. These advertisements made their appeal very respectfully, but convincingly. Moreover, they showed a thorough appreciation of the fact that the wages came, not from the employers, but from the consumer—and the men kept right on working.

The net result of all this was that the workers, having a legitimate case, obtained the increased wage without having lost a single day's pay through a strike; while the employers lost nothing at all, and the consumers suffered no inconvenience and were perfectly willing to pay the small, reasonable increase.

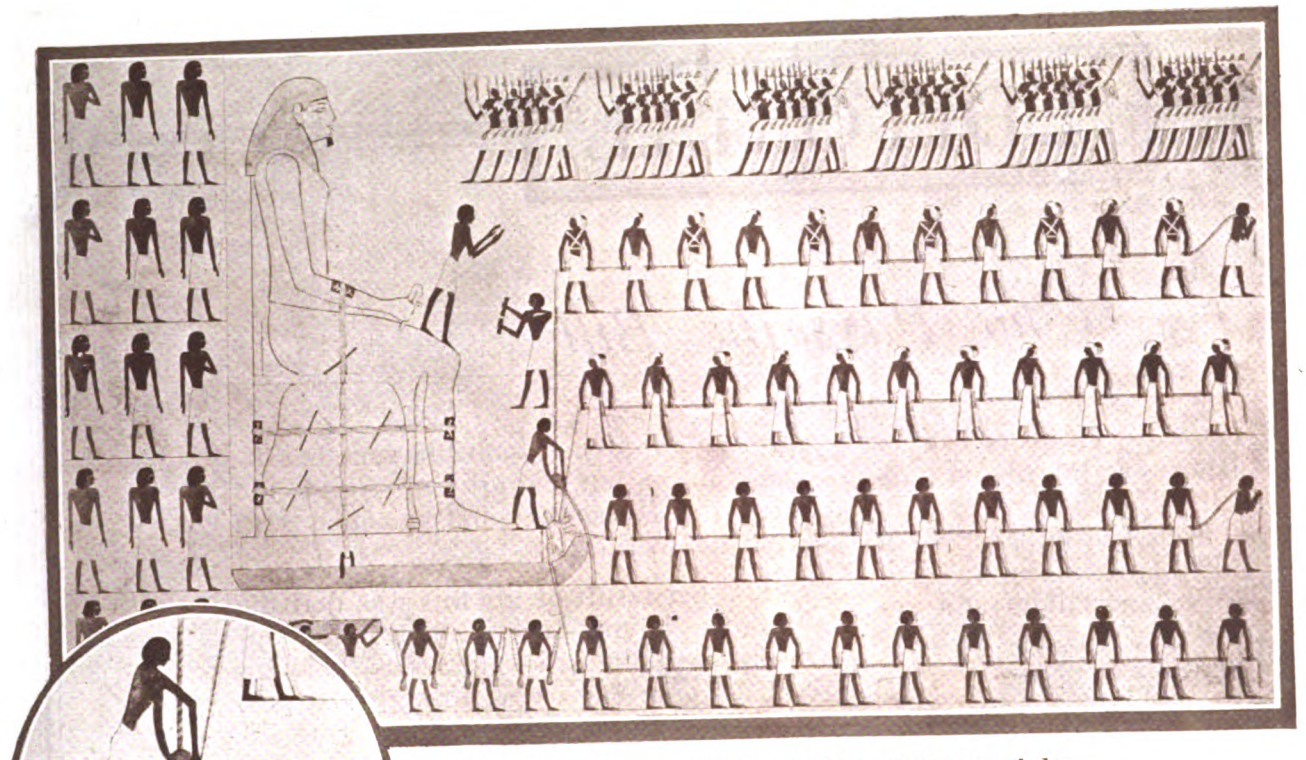
Here in America, a handful of railroad operators and coal mine operators and a few hundred thousand shopmen and coal miners have been wrangling for many months about questions essentially similar to the one which confronted the tea and silk packers of China. Being more enlightened than their brothers of the Orient, our miners and shopmen went on strike to force the issue. Already these strikes have cost the country not only untold inconvenience, but millions of dollars; and, no matter what the outcome, no party to the dispute can possibly receive benefit in proportion to what it has already lost through the strike.

In China, as in this country, the greatest sufferer from a strike must always be the consumer; and the consumer has neither organization nor leadership. But here, as in China, both worker and employer are organized. The difference seems to be that in the benighted Land of the Dragon both labor and capital look upon the consumer not as legitimate prey, but as the really essential factor—the one whose interests are paramount; the one whom they both must serve in order to market their wares.

Digitized by Google

The Evolution of Anti-Friction Bearings

By Philip C. Gunion



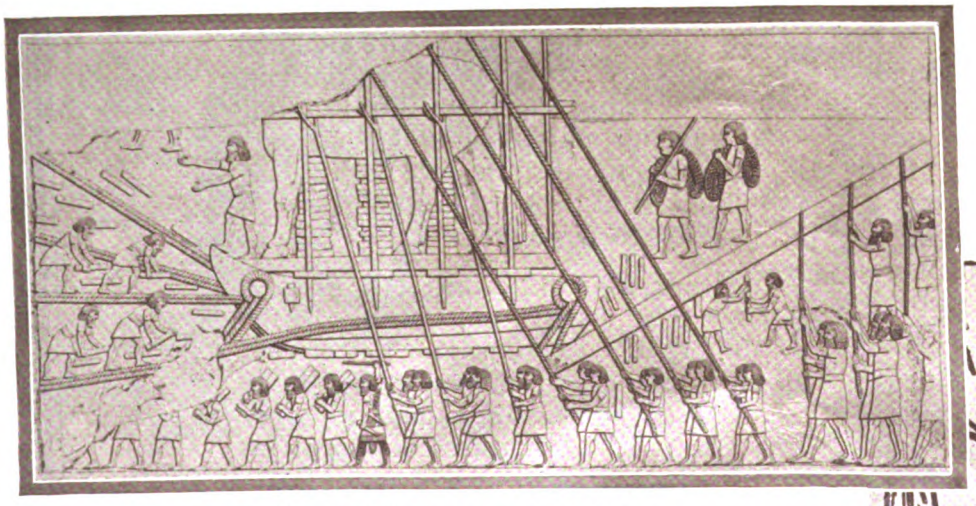
Transportation of stone statue on sledge. Lubricant is being applied by the man on the front of the sledge—ancient Egyptian painting on rocks at El Bersheh about 1900 B. C.

IN THE past two decades the term, "anti-friction bearings" has come to have a specialized meaning and denotes bearings of the ball and roller types. Correctly speaking, however, an anti-friction bearing is one designed to do away with or lessen friction, and careful examination of the bearings in use throughout those ages of which we have historical knowledge, will indicate that every bearing ever used was the result of an endeavor to lessen friction.

The historical period of the world dates back to about 5000 B. C. and although there is no doubt that many great things were being done at the dawn of history, the records are very hazy. However, some insight into the mechanical methods in use previous to this period can be gained by observation of those prevailing today among such primitive races as the Eskimo tribes and the Mexican Indians.

Egyptian history affords a rich field for an investigation of the origins of art, political science and military science because the ancient Egyptians have left behind them on their monuments paintings and sculpture which portray the great deeds in the lives of their rulers.

Inasmuch as the first engineering work of any importance was the erection of public buildings, it is very singular that we find no illustration of mechanical means used by a people who have left so many proofs of their skill in these



Using rollers and lever to move statue—Assyria about 875 B. C.

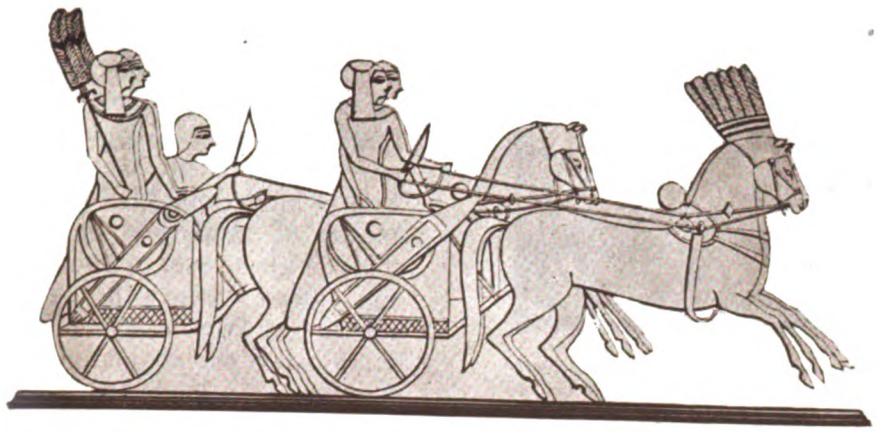


Crude form of wheel, probably a slice of tree-trunk —Chaldea, about 3500 B. C.

Use of rollers to move a heavy load easily—Roman battery ram about 50 B. C.



Digitized by Google



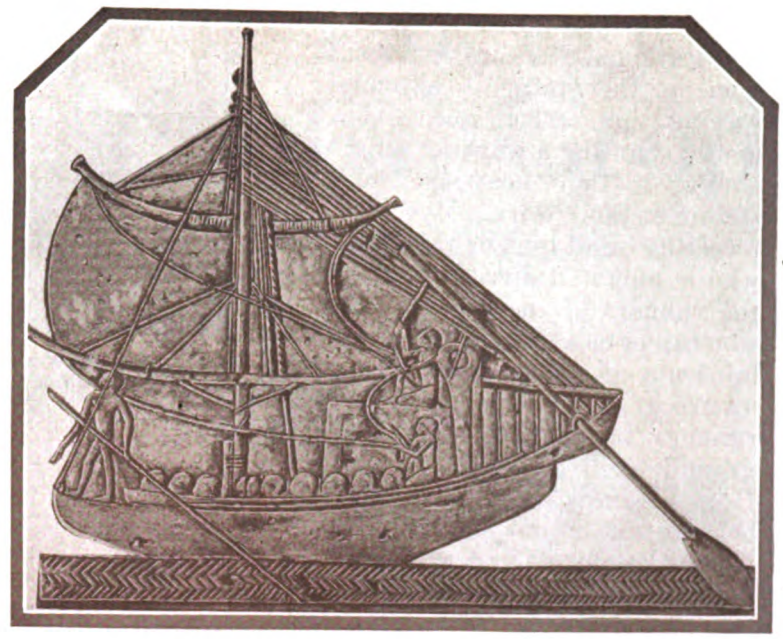
Light wheel spokes similar to modern buggy wheel, used on Egyptian war chariots—portrait shows the sons of Rameses the First. About 2000 B. C.

matters. Egypt was the primeval seat of what may be called material civilization and many arts and inventions were known there when the rest of the world was still in ignorance and barbarism.

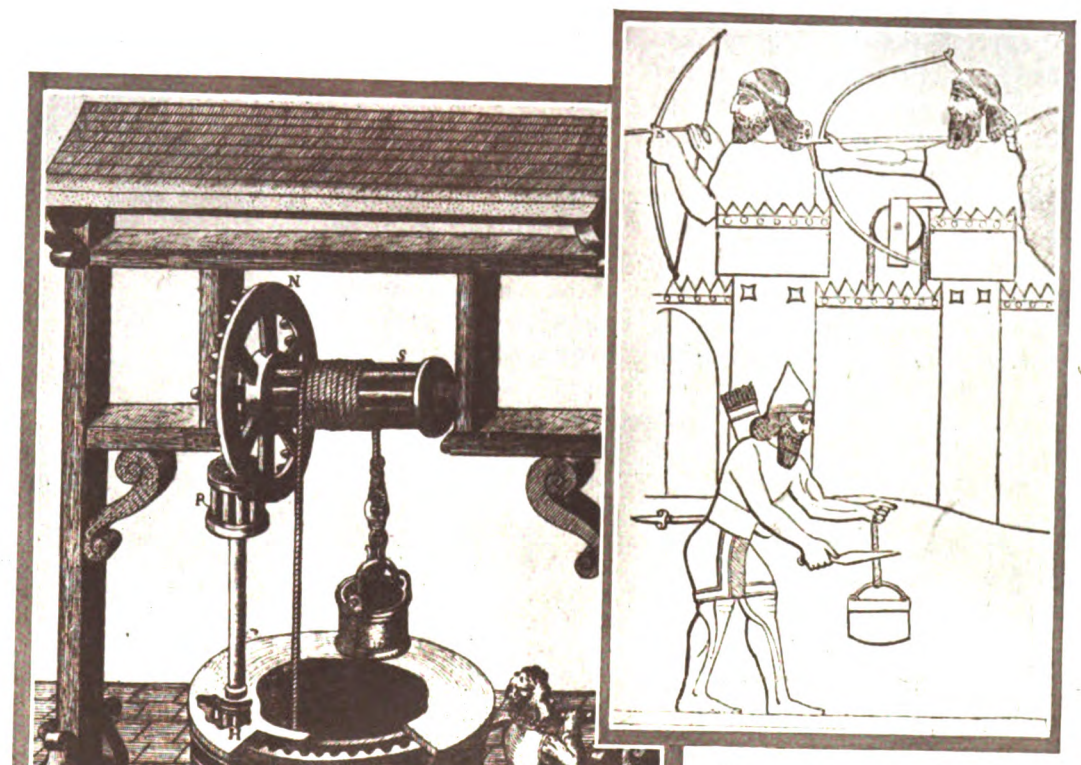
The first question that presents itself when we consider the building of the gigantic Egyptian monuments is the transportation of the enormous blocks of stone. At first these blocks were probably dragged along the ground from the quarry to the place where the structure was to be made. It is at once apparent to us that this meant the exertion of a large amount of energy on the part of the laborers and it was probably physically apparent to them long before their mental processes evolved the first step towards the decrease of friction by the use of bearings.

This first step was no doubt the use of a rude sledge consisting of a platform to support the block of stone and mounted on two runners. This constituted an anti-friction bearing because the load was concentrated on the narrow surfaces of the runners and these surfaces were smoother than the surfaces involved when the block was dragged on the ground.

Fortunately, we have clear evidence of the existence of this first type of anti-friction bearing. A picture existing today painted on the rocks in a grotto near El Bersheh shows the method of transporting a huge statue of solid stone twenty-four feet in height. This statue was mounted on a sledge, and attached to the runners are ropes dragged by eighty-eight men, each

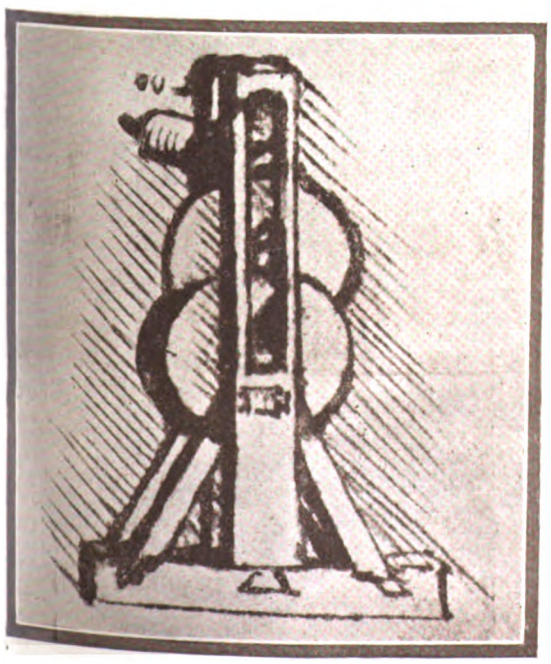


Showing dead-eyes on Egyptian ship, 3500 B. C. The dead-eye is the forerunner of the pulley.

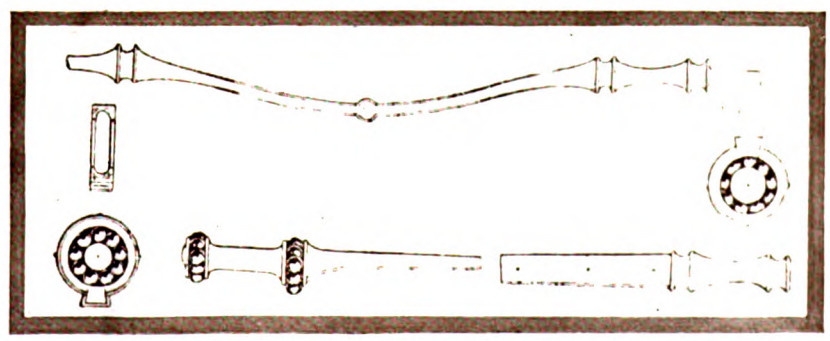


The simple pulley installed; as shown on a fragment from Nineveh, of about 875 B. C.

Rollers used as trunions under a well curbing, where motion around the well was transformed into power to pull up the bucket. About 1500 A. D.



Sketch made by Leonardo Da Vinci, the Italian engineer and artist, showing a device whereby the axle of one roller was carried on the periphery of another. Probably a speed-reducing device. 1500 A. D.

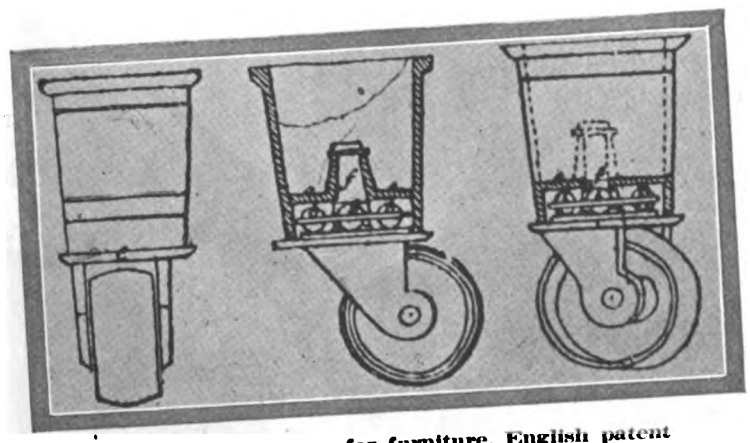


Ball-bearing wagon axle, English patent 2000, taken out in 1794 by Philip Vaughan.

Digitized by Google

man shown in profile according to the Eqyptian method of illustration. Standing on the knee of the statue is a man waving his arms and evidently chanting a working song similar to the "heave-ho" of sailors at their work. Most interesting of all to us is the man who is mounted directly above the runners of the sledge and who can be clearly seen pouring lubricant of some nature from an urn in such manner that the runners in passing over the ground will be lubricated. Here we have an anti-friction bearing that is not only superior to the old method of dragging the stone on the ground but is lubricated as well.

There exist today two analogies of this first type of improved bearing. First, the sleds used by the Eskimo Indians of the Arctic region. The runners are wrought from driftwood or whalebone and shod with strips of walrus ivory fastened by wooden nails or lashed on with rawhide. When the vehicle is ready to start the Eskimo inverts it, fills his mouth with water and blows it along the runner where it freezes, filling the cavities and lubricating the surface. It only remains for him to polish the ice-crusted runner with his mitten to obtain a surface which in contact with smooth ice presents a bearing which probably develops less friction than the highest types of modern bearings.



Ball-bearing casters for furniture, English patent 4481, taken out by Joseph Harcourt in 1820.

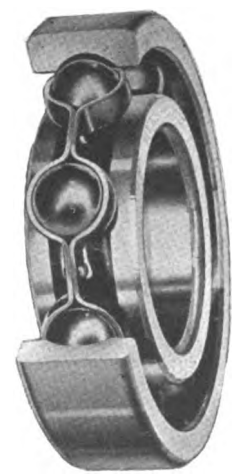
The second analogy is the method used by the Khasi hill tribes of India in transporting the huge monuments of solid stone which they still erect. The slabs of sandstone are quarried by means of wedges near where they are to be set up. Some of these slabs weigh as much as twenty tons. They are moved on a cradle made of strong curved limbs of trees, smooth and rounded so as to present little surface to friction. To put it in other words, this cradle as compared with dragging the stone on the ground, is an anti-friction bearing.

It is evident that logically the next step in the improvement of bearings was first the use of rollers placed on the ground under heavy loads, soon superseded by the primitive wheel. Ancient history, and observation of the wheeled vehicles in use by the primitive tribes of Mexico today, indicate that the first wheel was a circular slice from a tree trunk with a hole drilled in the middle for the reception of a rude form of axle. Here we find that they concentrated the load still more and carried it on a surface of small area which could therefore be made of superior material. Their object was, of course, to get away from the large amount of friction which existed between the ground and the runners of a loaded sledge.

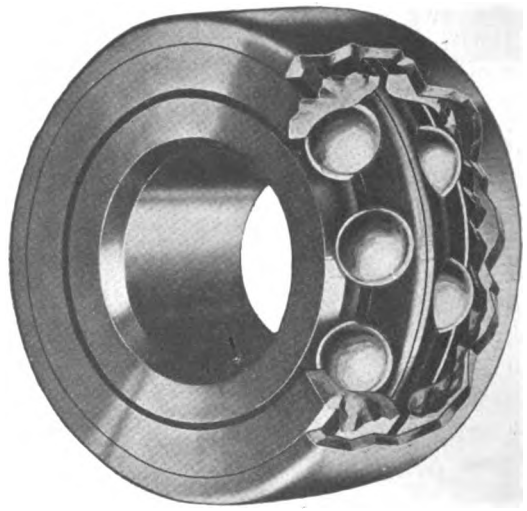
We find, however, that the wheels of ancient Egypt were not like the clumsy contrivances of unenlightened tribes of today but more like our own. More than four thousand years ago the Egyptians had chariots of war. A picture of the sons of Rameses the First shows them in a war chariot equipped with wheels having six spokes radiating from a hub which turned on an axle and was held in place by a linch pin through the axle.

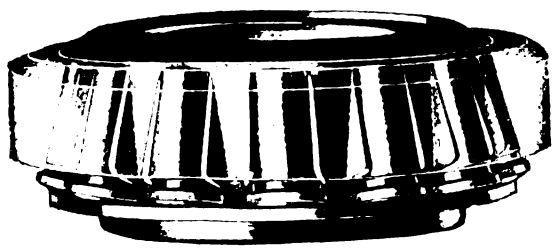
Wheels and axles of an improved nature were long known in Britain, for Cicero expresses the opinion that there was little in the Island worth the trouble of transporting to Rome except the British war chariot, which

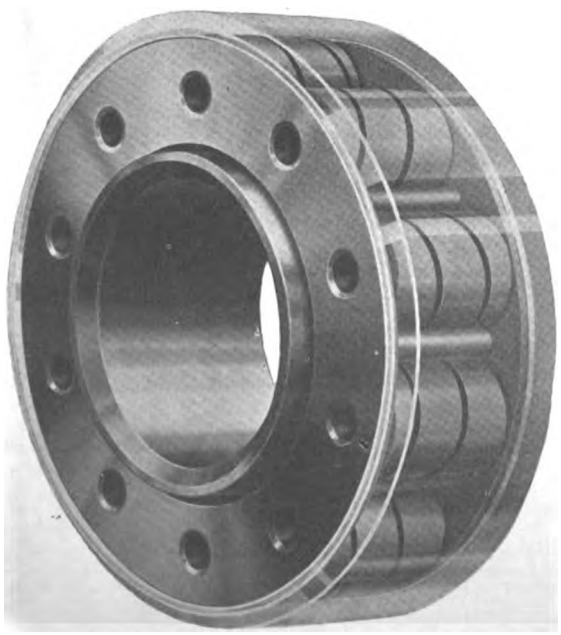
(Continued on Page 37)

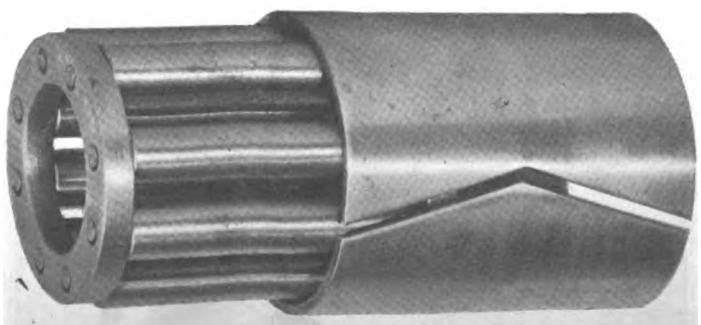




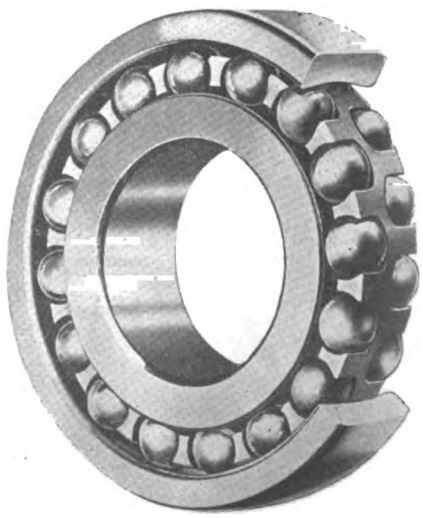








Modern forms of ball and roller-bearings for machinery applications of all kinds—1922.



Digitized by Google

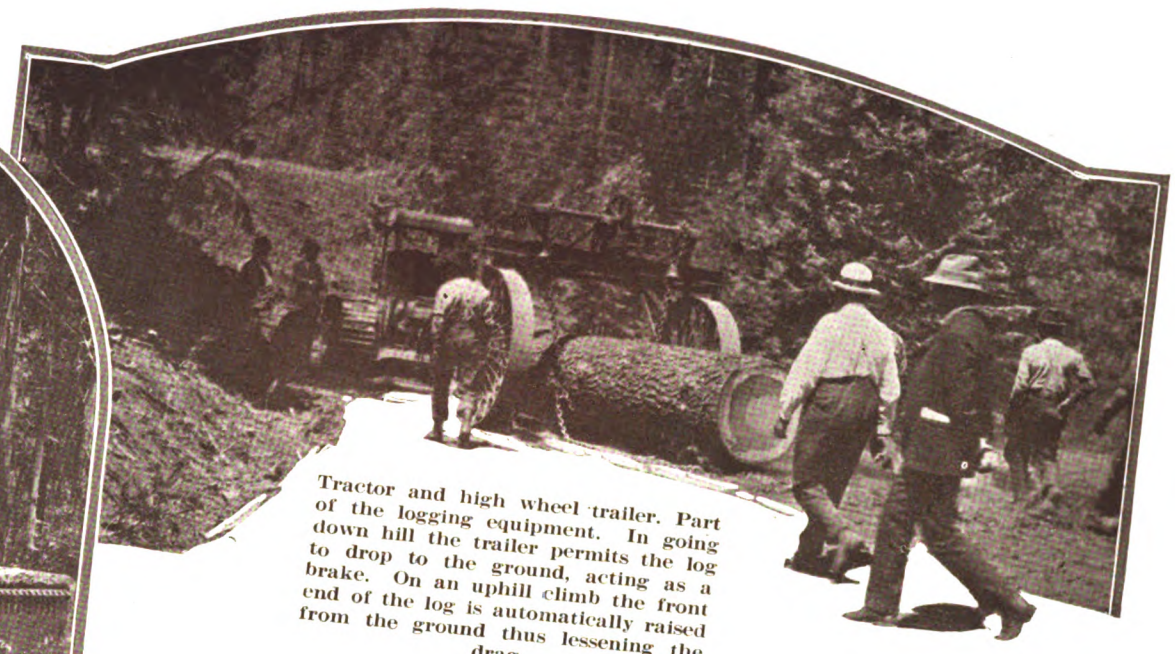
Harnessed Mountain Energy
Harvesting the Mountains' Crop

Hydro-Electric Power Applied to Lumber Operations

By Arthur W. Ford



Holt Caterpillar tractor and logging trailer in a scene where the men are letting the machinery do all the work.



Tractor and high wheel trailer. Part of the logging equipment. In going down hill the trailer permits the log to drop to the ground, acting as a brake. On an uphill climb the front end of the log is automatically raised from the ground thus lessening the drag.

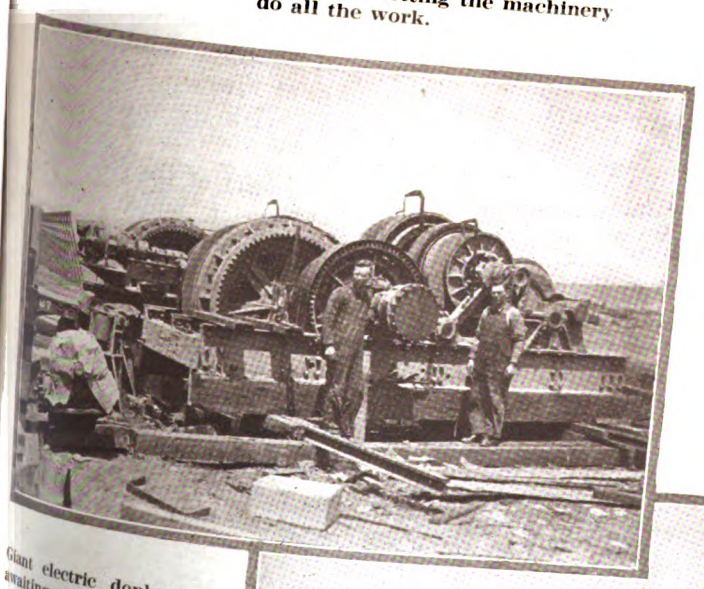
WATER power, tumbling down steep mountain slopes, converted into electric energy and transported through copper cables to other mountain ridges, is engaged, near Oroville, California, in harvesting virgin timber, the crop of the mountains.

Again, this mountain energy is transported from the hydro-electric plant in the canyon of the Feather river to Oroville where the big logs are assembled. Here, through the use of 133 electric motors, the timber crop is fashioned into lumber of lengths and dimensions for buildings required by mankind.

The operations are those of the Hutchinson Lumber Company, a West Virginia concern with approximately eighteen years experience in lumbering in West Virginia, North Carolina, and Kentucky.

From the standpoint of the use of electric power in both its woods and mill operations, the plant of the Hutchinson Lumber Company is probably the most modern in the United States. The mill was given its

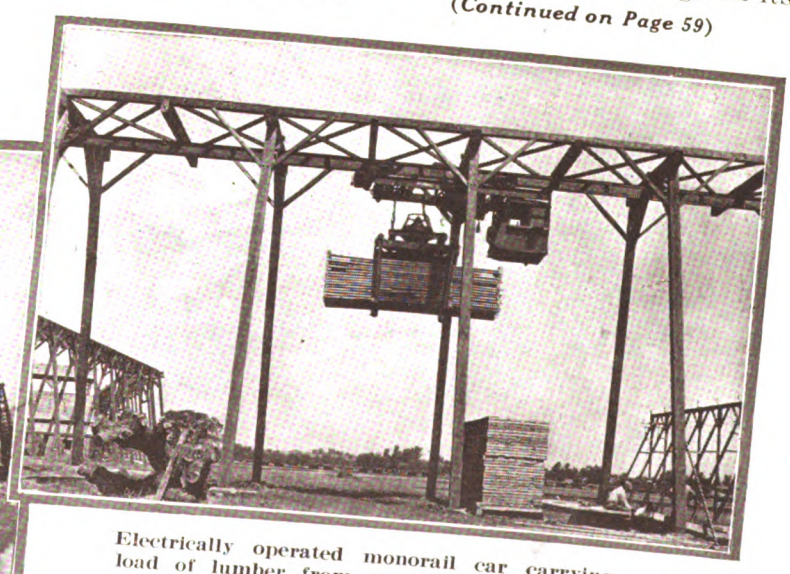
(Continued on Page 59)



Giant electric donkey, awaiting shipment into the forest. The winding cable operates is turned by a 300 horse-power electric motor.



California White Pine and Sugar Pine logs. These logs are 32 feet in length and stretch practically the entire length of a standard sized flat car.



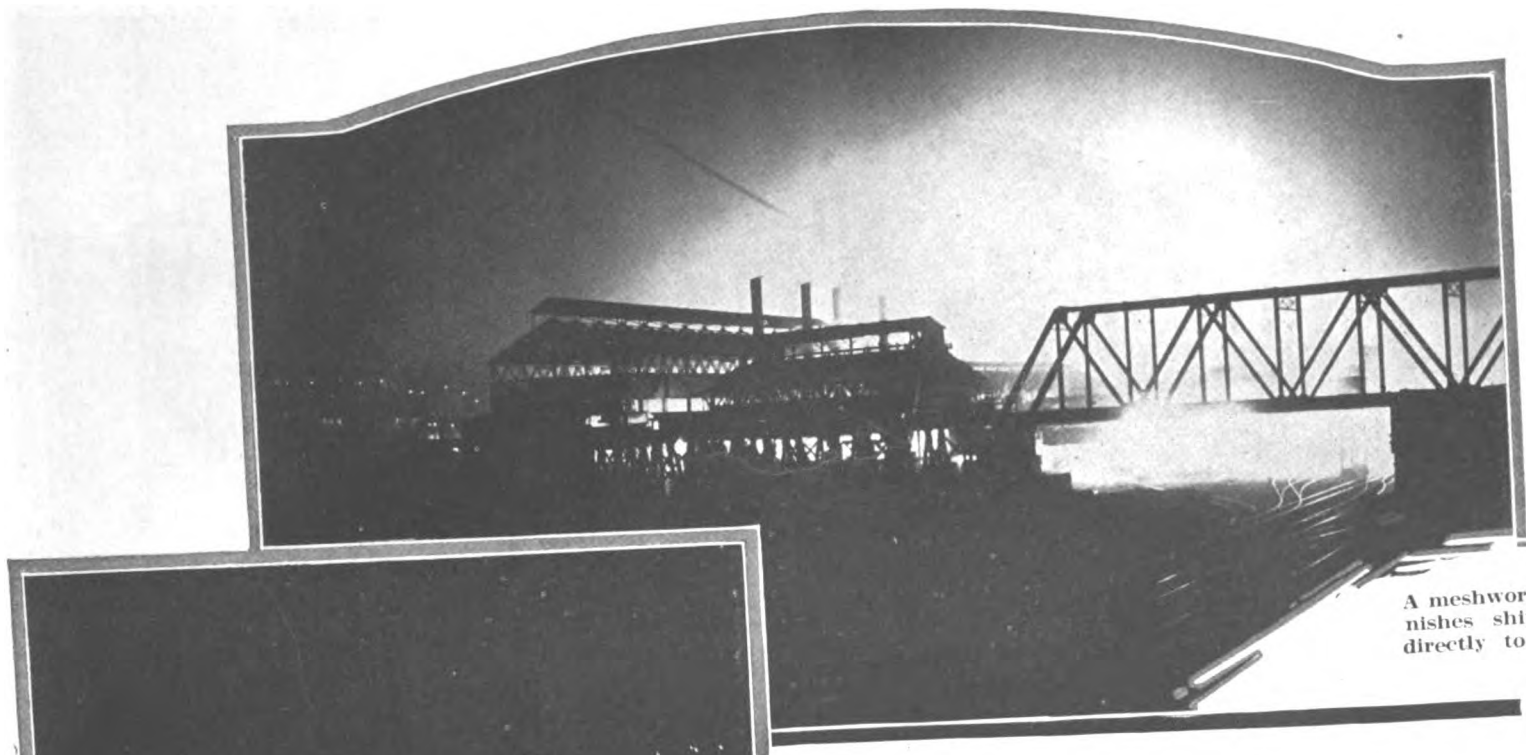
Electrically operated monorail car carrying load of lumber from green sorting shed to yards.

Digitized by Google

Night in the Steel District

The Angry Red Glare that Means Tonnage

(Photographs by Vander Weyde)



A meshwork of railroad tracks furnishes shipping facilities leading directly to the great steel mills.



A busy scene at the great converter of one of the big steel works, Bessemer, Pa.

SKY-SCRAPERS, bridges, ocean greyhounds, motor trucks—all dependent on Steel. Steel, which in some form enters into almost every phase of this mechanical age. In romance, in every day manufacture of necessities, in far-sighted statesmanship and in sordid politics—in all of these, Steel has played its part. And the story of steel is not a finished chapter, but a story without end; a romance in itself, and at the same time a fact-story which is still in process of revolutionizing civilization.

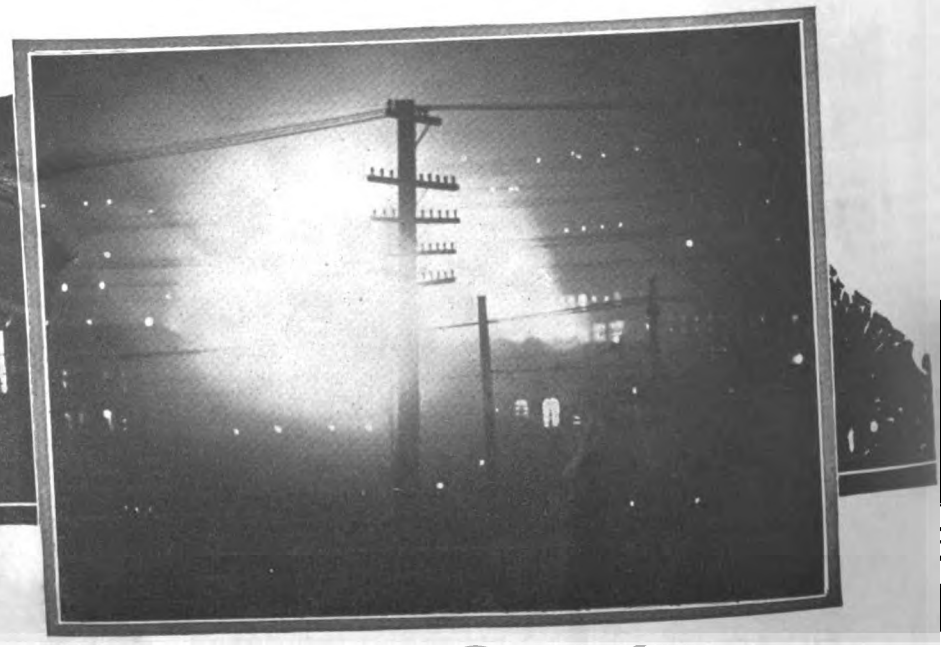
In the manufacture of most commodities there are parts or processes—little "light touches"—which relieve the sombreness of the whole. Even in the highly specialized quantity production of motor cars, the general impression is colored by the final product, lightened by the evident kinship of most of the work with the intelligence of man.

In the heart of the steel-producing district, which centers about Pittsburgh, it is the total



A blast at the Carey Steel Works in Homestead, one of the great steel suburbs of Pittsburgh.

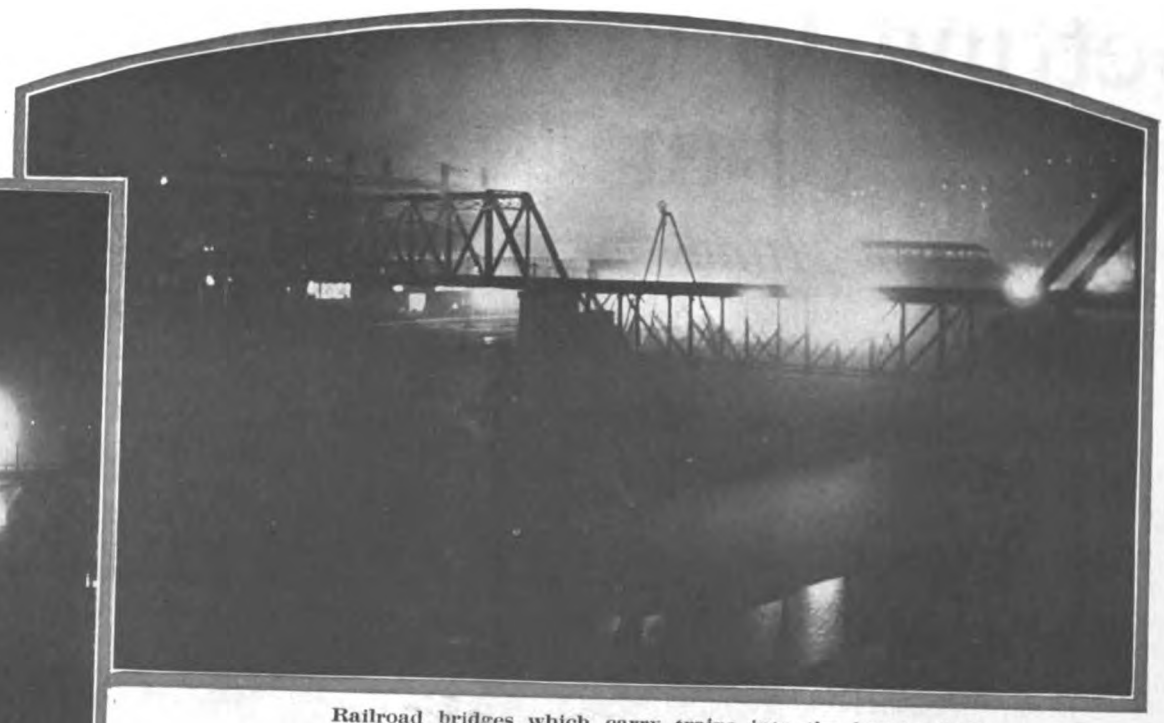
A night view of work at the mills in McKeesport.



Digitized by Google



he steel mills are in full blast by night as ell as day. This view shows the important eel works at Homestead, Pa., and forms the subject of our cover for this issue.



Railroad bridges which carry trains into the heart of the mill district.



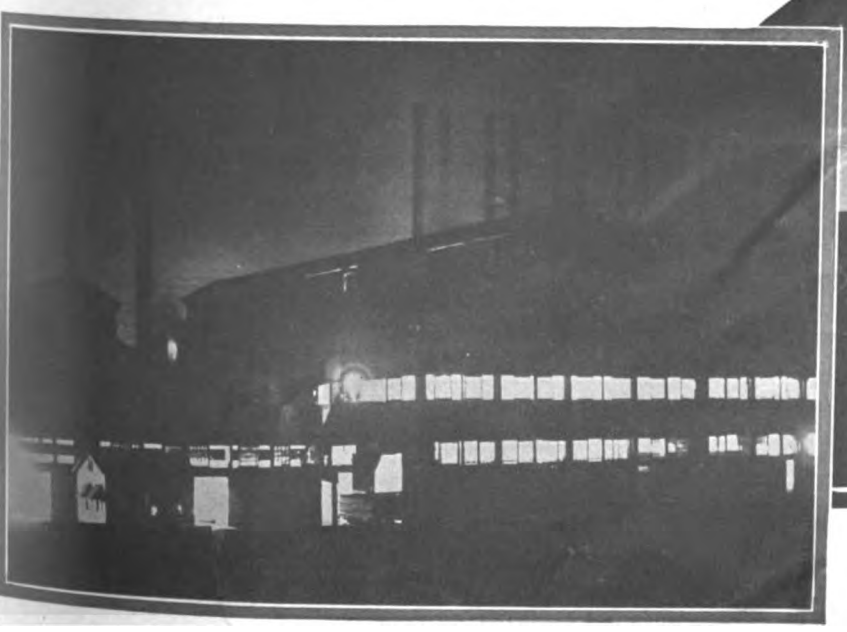
A Bessemer converter at work at night. (Bessemer, Pa.)

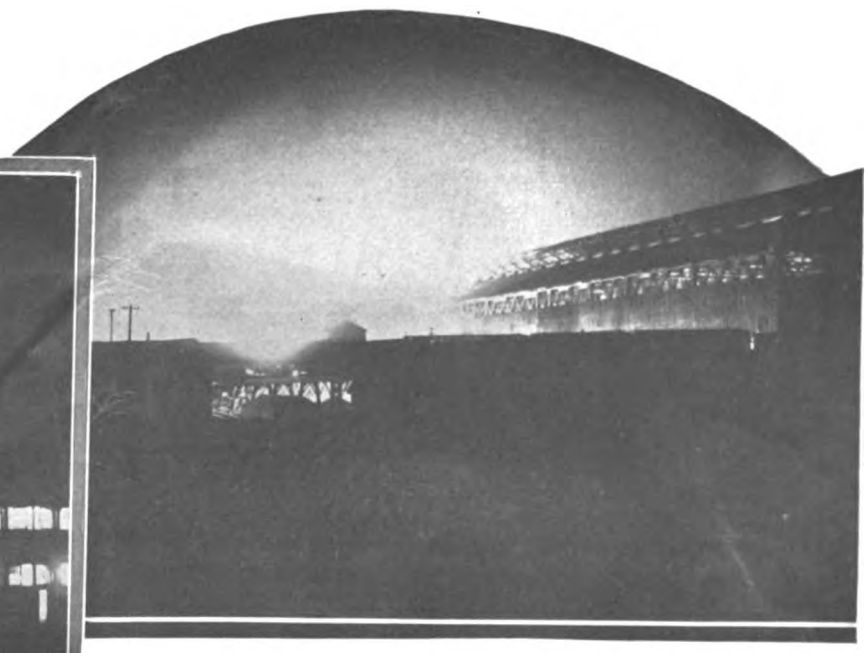
f these relieving touches ost impresses the observ- he product—steel, in bil- ars, rails, plates—pours o meet the incessant de- for "tonnage." The thing is so stupendous as e man seem a pigmy. It nough the whole vast ag- ation of furnaces and nery, inanimate mechan- eated by man, had be- animate—a relentless, eaded dragon which nust serve but cannot control; a monster whose incessant hunger-cry is "Tonnage—more tonnage."

Cold, somber, smoke-shrouded by day; it is only at night that the monster appears in all his colorsome, awesome majesty. Roaring his defiance, licking the low-hanging clouds with tongues of blood-red flame; blowing his hot breath on the toiling, sweating human ants that serve him; occasionally reaching out and engulfing one in his incandescent maw—this is the dragon which man has created—this is Steel.

(*Continued on Page 31*)

The great steel works at Homestead, Pa.





A blast in progress at the great mills in Wilkinsburgh.

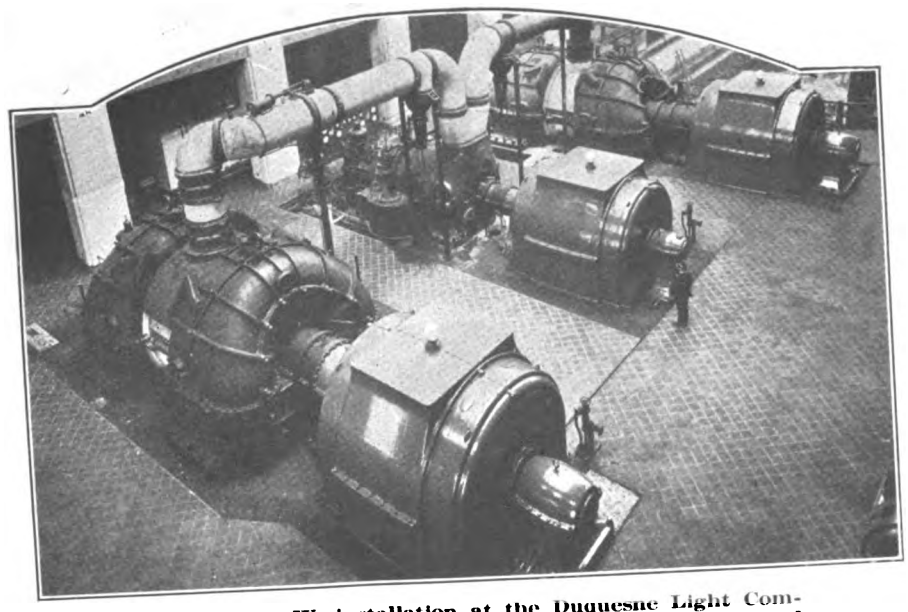
Digitized by Google

Getting One Hundred Cents Out of the Power Dollar

A Further Attack on the Thousand-and-One Wastes that Dissipate Our Coal Supply

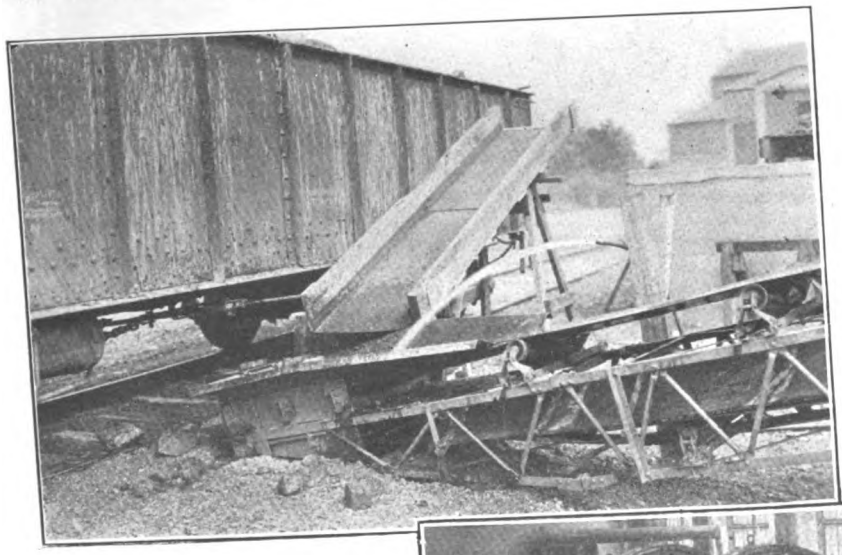
INEVITABLY, as one goes more deeply into this question of industrial power, he is impressed by two outstanding facts: the immense amount of capital tied up in machinery solely for power production; and the immense amount of waste involved in present day practice. If it were not for the first of these two—the amount of capital invested in existing power plant equipment—engineers could probably cut the wastes and inefficiencies in power generation by one-half.

But it takes time and labor and thousands of dollars to equip a power plant: and if, tomorrow, new discoveries result in machinery much more efficient, that does not mean that we can afford to scrap the existing equipment and write off the investment; at least not unless the saving is so great as to absorb the loss in a short period of time. An instance of this kind actually arose in the case of the Ford Motor Company. With the completion of its River Rouge Plant (the stupendous industrial unit which is now being described for the first time in a series of articles in *Industrial Management*) the Ford Engineers find that they can supply the power requirements of both the new and the older plant, from the new power station. In fact, the older factory can be supplied



A 60,000-K. W. installation at the Duquesne Light Company, Colfax, Pa. The second unit is now being installed and the plant will eventually contain six units of this size. Only one other generator of this size has ever been completed and put into operation.

Dwight P. Robinson & Co., 125 East 46th St., N. Y.



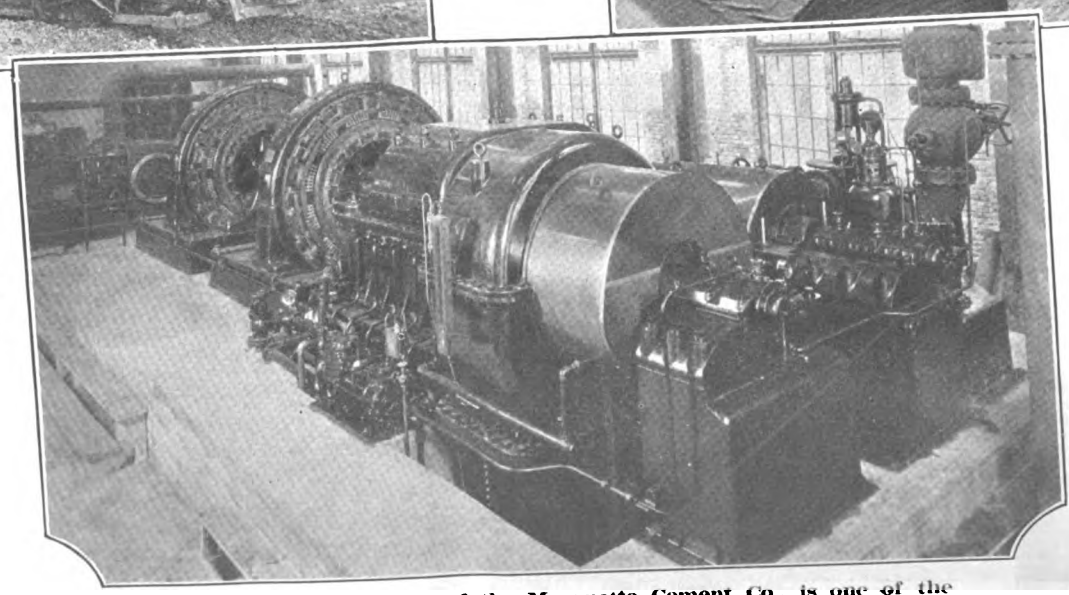
A power plant at Moosehart, Ind., has abundant space for coal storage. The coal is piled in semi-circular piles so arranged that a series of conveyors can be set to reach any pile. The conveyor on the left has its wheels set for "fanning," or in other words making one of these semi-circular storage piles.

Barber-Greene Co., Auroa, Ill.



A simple but effective method of keeping the dust down while unloading coal is shown in the above picture. The coal is dumped into the hopper of the conveyor and receives a good bath before it goes up the belt. This eliminates practically all dust and interferes in no way with the operation of the machine.

Barber-Greene Co., Auroa, Ill.



This unit in the plant of the Marquette Cement Co., is one of the largest direct current, turbine driven generators ever constructed. Its capacity is 3,750 K. W.

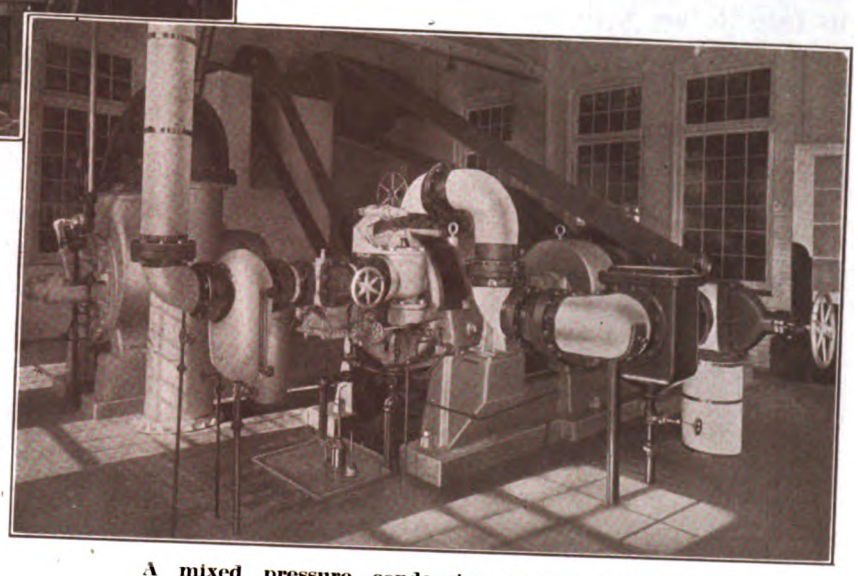
De Laval Steam Turbine Co., Trenton, N. J.

Digitized by Google



A modern control room where the energy generated by steam and turned into electricity is distributed for use. This installation is at the Duquesne Light Co., Colfax, Pa., and represents the last word in convenience and efficiency.

Dwight P. Robinson & Co., 125 East 46th St., N. Y.



A mixed pressure condensing turbine belted to the same line shafting from which it receives its low pressure steam. Should the engine fail the turbine would automatically take the entire load.

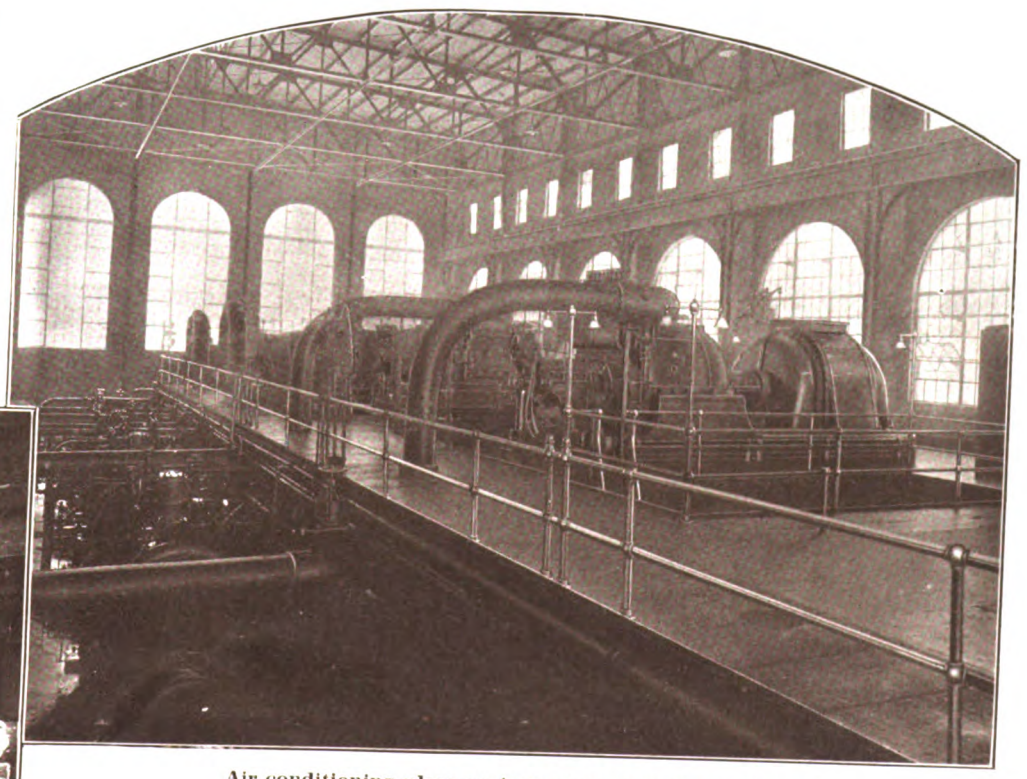
Terry Steam Turbine Co., Hartford, Conn.

with power at a cost far below that of its own power plant; though the latter was, a few short years ago, one of the most efficient and up-to-date power installations extant. So, in line with the Ford policy, the less efficient power plant is to be scrapped. In this particular case, of course, it is only because of the wonderful linking of processes and utilizing of by-products, that the saving in power costs becomes so enormous.

There always will be waste, in every line of human endeavor. Not even the most enthusiastic engineer would claim that we can ever eliminate all waste.

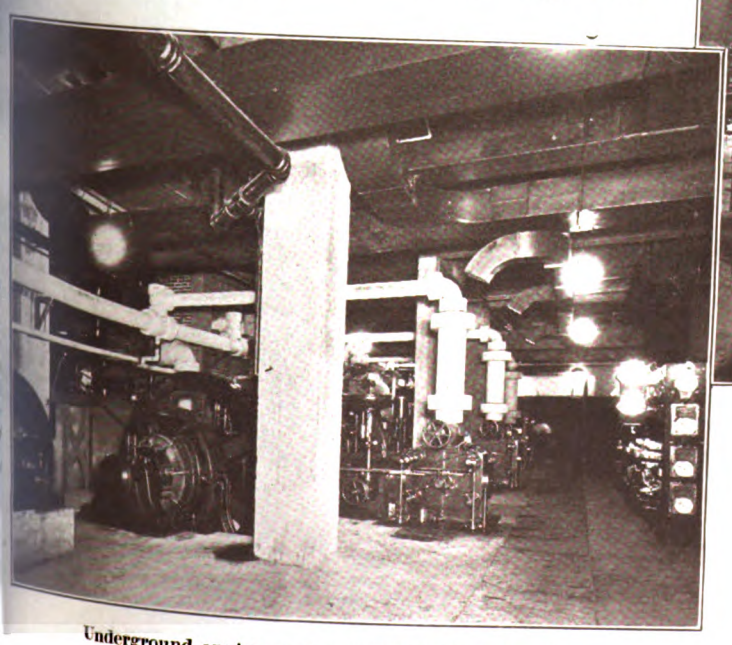
But the item of preventable waste—the losses due to ignorance, to stubbornness, to plain mental laziness—this is the thing we, in industry, must attack. As we come to see more and more clearly the inter-relation, not only of individual plants in the same industry, but the actual inter-dependence of all the units which go to make up Industry—it becomes plain that the wasteful power plant is not merely causing a loss to its own organization, but is a tax on all of us. The fuel and the money such a plant wastes, must be made up out of the general store. By just that much, it lessens the resources of Industry as a whole.

Excluding steam locomotives, with their extremely low load factor, we have in this country according to the best estimates about forty million horsepower capacity in prime movers installed. The load factor being close-



Air conditioning plays an important part in a modern electrical power plant. Modern science and engineering skill provide a supply of clean cold air to generators, enabling them to carry safely higher loads and insuring longer life to insulation and wearing parts. Above are shown five turbo-generators in the municipal power plant of Jacksonville, Fla., supplied with cool, washed air.

Atmospheric Conditioning Corp., Philadelphia, Pa.



Underground engine rooms are usually hot and uncomfortable. Air washing and dehumidifying equipment, however, make this one cool. Note the overhead ducts through which the cool, clean air is introduced.

Atmospheric Conditioning Corp., Philadelphia, Pa.

Digitized by Google

ly estimated at 25%, we make use of roughly ten million horsepower hours for each working hour, or almost 23,000 million horsepower hours per year. So that the elimination of only the readily preventable wastes in our power generation would produce power enough to run several good-size factories.

The complete tie-up in coal production for more than four months of this year has brought us face to face with the entire subject of power in a new way. Whatever may be the actual merits of the dispute between coal miners and operators, it is perfectly obvious that we are not going to have "pre-war" coal prices in the near future—if ever. Nor can we find a substitute for coal, in the present state of our knowledge.

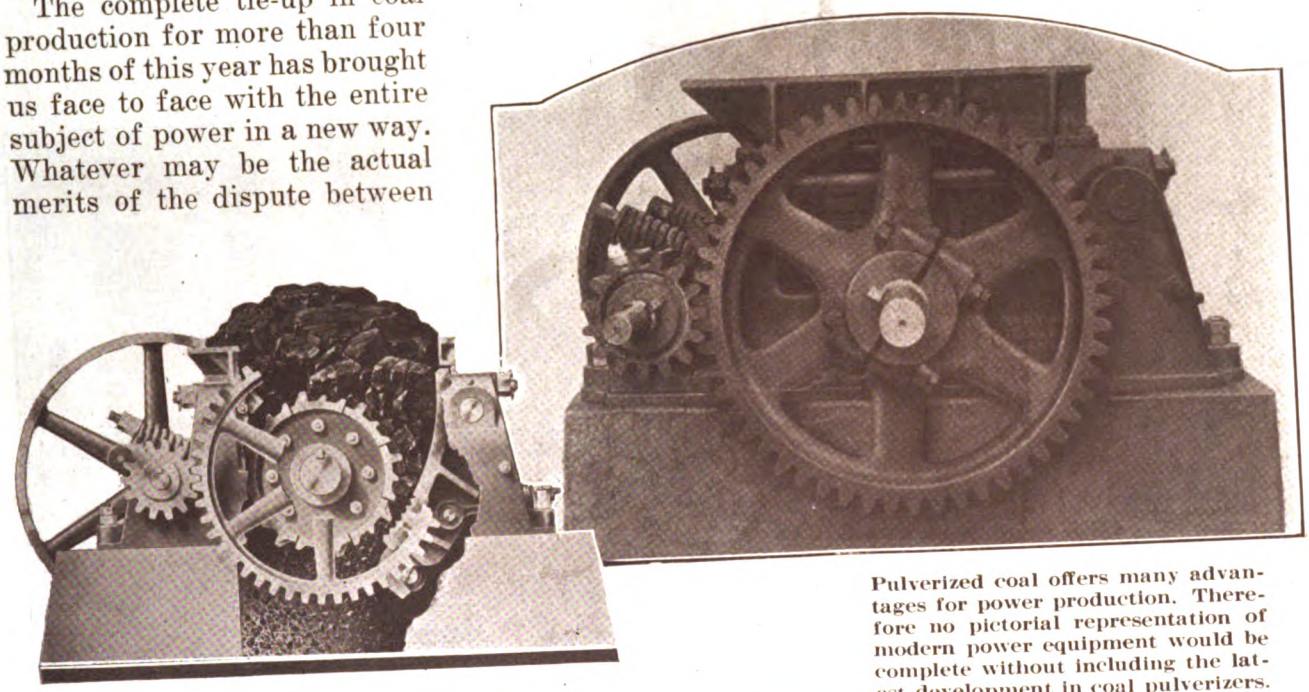
We have undeveloped water power, it is true; and one of the important tasks before us is the full development and utilization of our water-power resources. But even the most optimistic are forced to admit that there is not enough water-power available to enable us to dispense with coal.

Oil, too, is being used increasingly as a fuel for power generation. But if we were to translate our present power requirements into terms of oil production, the producers and refiners would be quite unable to meet the demand. And it must not be forgotten that geologists declare our coal resources underground to be some six thousand times our oil resources, so far as present knowledge goes.

The answer, then, to our power problem is threefold: Develop to the full our water-power; develop the use of oil as a fuel; and devote the most minute attention to getting better efficiency from coal. The first is a matter of years and of immense capital investment. The second is also a matter of time and of investment in different equipment. The third is the most important and immediate; it is something that can be done at once and without involving investment out of proportion to the immediate returns.

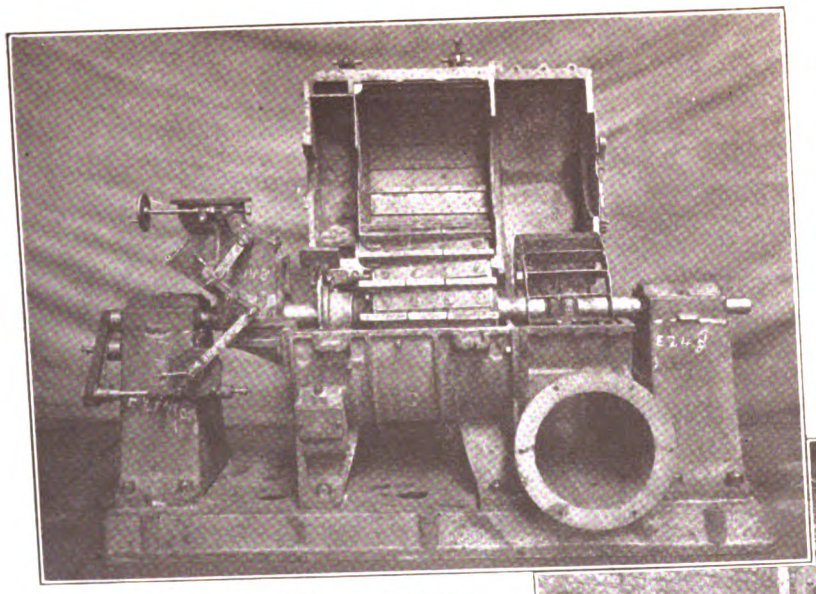
It was with this third factor in mind, that the present series of pictorial articles was planned: in order to tell what can be done, by showing what *actually is being done* in the more efficient coal burning power plants today. And, to drive the idea home, we cannot do better than to quote from an article on this subject by David Moffat Myers in *Industrial Management* for May, 1922—

"You have discovered the existence of preventable waste. Your operation is below standard for your type of plant. You know the extent of the waste of fuel and have figured in a very simple manner the number of tons of coal and dollars of money you can save in a year's operation. If it doesn't cost too much to do it you would like to save that coal and that money and reduce the cost of your manu-



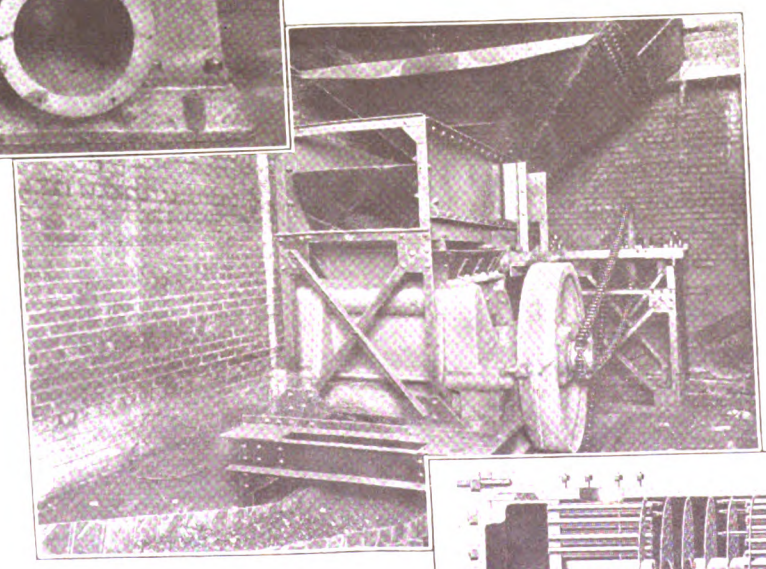
Pulverized coal offers many advantages for power production. Therefore no pictorial representation of modern power equipment would be complete without including the latest development in coal pulverizers. Installation pictures are hard to get due to the inaccessibility of the apparatus, which as a rule is installed out of the convenient range of the camera. This illustration above shows a modern coal-crushing unit and the illustrations just below it is a cross-section showing how it operates.

Pennsylvania Crusher Co., Philadelphia, Pa.



Coal pulverizers of the type shown herewith have a capacity of from 1000 to 6000 pounds per hour, and require from 20 to 80 horsepower to operate them.

Erie City Iron Works, Erie, Pa.



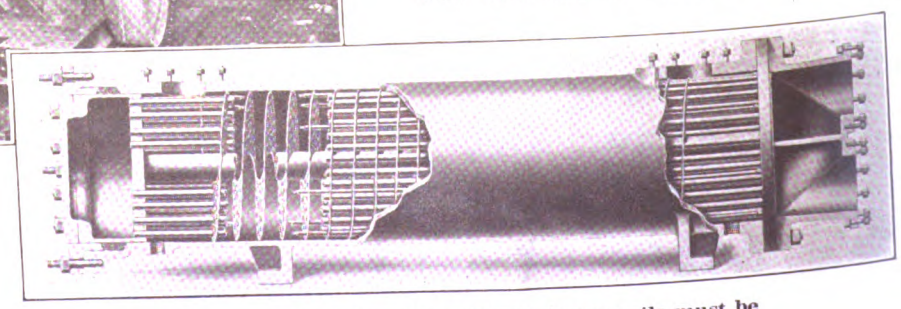
Here is a single roll crusher delivering coal to a steel apron conveyor from which point it is delivered to overhead bunkers.

Jeffrey Manufacturing Co., Columbus, Ohio.



The heavy grades of oil now in use as boiler fuel cannot be successfully burned without pre-heating. The oil heater shown in the illustration is used for this purpose, and is made up with all of its joints external to the steam space in order to prevent contamination of the high pressure steam condensation through oil leaks.

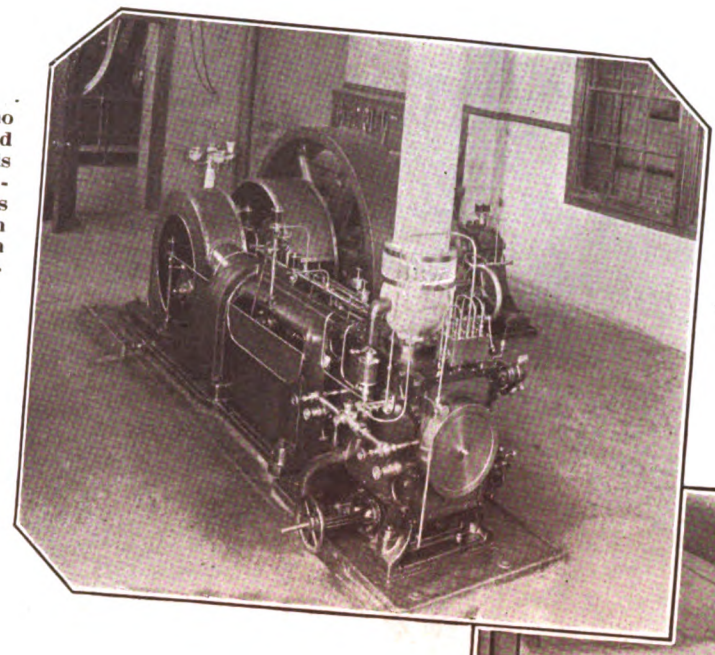
Griscom-Russell Co., 90 West St., New York.



Turbine lubricating oils and transformer oils must be continuously cooled to give proper viscosity and to permit continuous use. The unusual feature of the cooler shown in the illustration is the patented helical baffle which directs oil in its flow through the shell.

Griscom-Russell Co., 90 West St., New York.

Digitized by Google



In the modern engine room one no longer sees the once familiar oiler and his oil can. Machinery has taken his place in the way of automatic lubrication systems, each part that requires oil being fed it under pressure through pipes. Here is a splendid illustration of this in the Aspinwall Pumping Station, Aspinwall, Pa.

S. F. Bowser & C., Inc., Fort Wayne, Ind.

factured product by just that amount.

"Thus far, although you have learned the amount of preventable waste, you do not know the cause or causes of the losses nor how to stop them; that is unless you have got way ahead of me and I hope some of you have, for I am setting an easy pace. But this chapter is written only for those who need help.

"When you are motoring, and your car suddenly stops without warning, you know something is wrong; and if you are an old hand at the game you also know the rather long list of things that may be wrong. So you go about testing one possibility after another until you find the cause of the trouble. You will probably have in mind during your investigation the order in which things are most likely to go wrong, and by trying the most vulnerable parts first you will usually save yourself some valuable time.

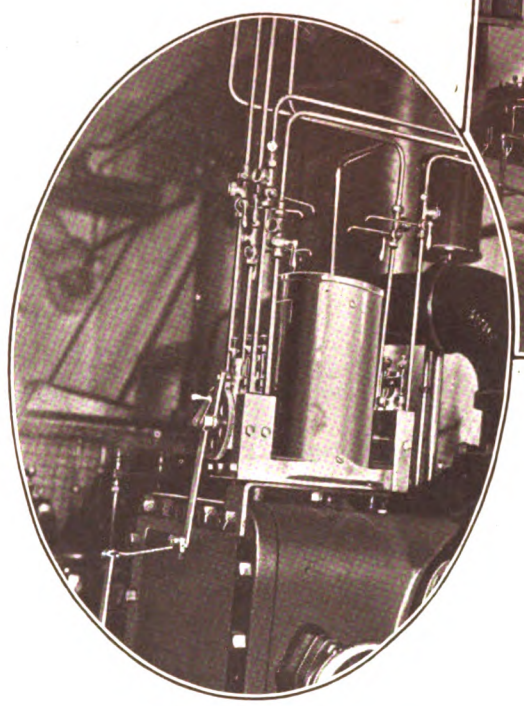
"Something, or several things, are wrong with the operation of your boiler plant. A list of the things that can go wrong can be made and these items can be set forth in the usual order of their im-

(Continued on Page 26)



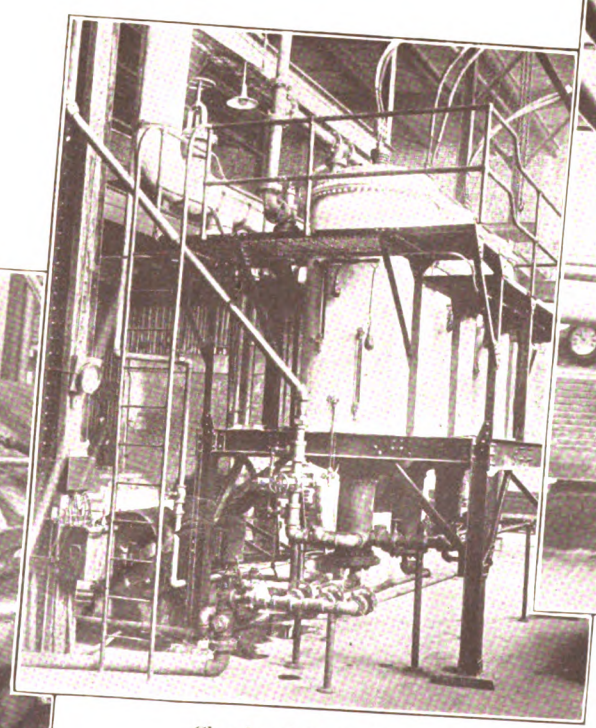
In order to lubricate properly oil must be clean. Below is a view of the power plant in the Woolworth Building, New York. Note the pipe lines supplying clean, cool oil to the electric motor in the foreground.

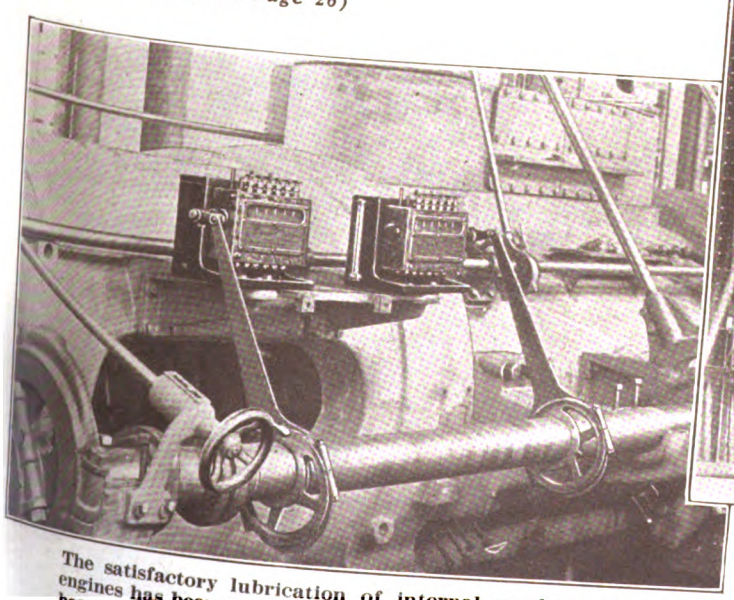
S. F. Bowser & C., Inc., Fort Wayne, Ind.



The "business end" of an oiling system is shown at the left, attached to the cylinder of steam engines. The pump is operated by a ratchet mechanism and the oil supply tank delivers clean, warm oil to the cylinder and moving parts.

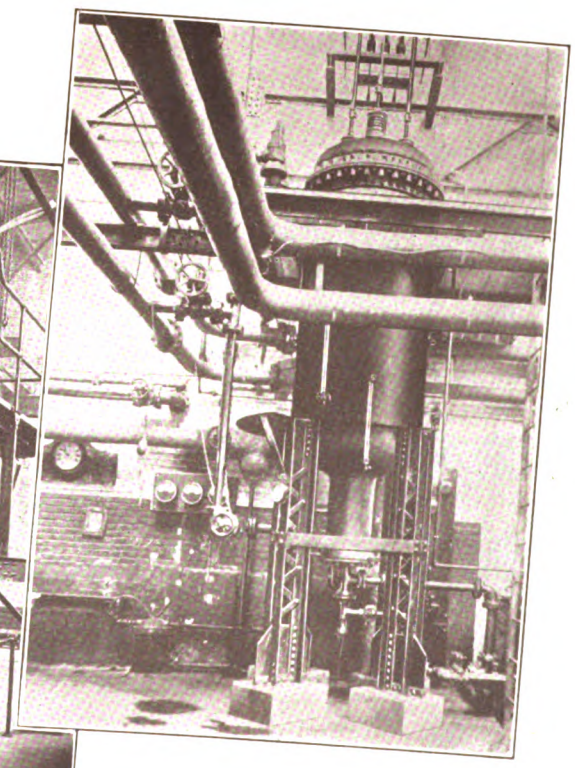
Greene, Tweed & Co., 109 Duane St., New York.





The satisfactory lubrication of internal combustion engines has been a difficult problem but one that has been successfully solved by the mechanical lubricators shown above. They are driven from the lay shaft and adjusted so that the pumping plungers operate in synchronism with the engine pistons, the oil being delivered directly on to the pistons at the end of each stroke.

S. F. Bowser & C., Inc., Fort Wayne, Ind.



Closely akin to the coal-fired steam boiler but more specialized in its purpose is the electric steam generator, the most important application of which is in industries within the range of hydro-electric power plants where use may be made of surplus energy that would be otherwise wasted. These electric steam generators generate steam at any specified pressure by means of high tension alternating current, led directly through electrodes of special design into the water to be evaporated. The amount of steam generated pressure, and the amount of electric power used are governed by the height of water in the vertical tanks.

Electric Furnace Construction Co., Philadelphia, Pa.

Digitized by Google

Sand---a Magic Substance

The Many Uses that Make a Well Known Material Indispensable to Industry

BY ROBERT H. MOULTON

A sand blast, as nearly everyone knows, consists of a box, a tube and a good head of compressed steam. We have seen how easily glass, stone, metal and other hard substances may be cut, ground, or polished when the gritty particles are directed against it. It is not generally known, however, that if the same stinging jet is directed against soft rubber or the human skin it will make no impression whatever. But if by any chance the particles strike a finger nail the nail is gouged away in a flash. That is one of the curious features of the sand blast, an invention now more than half a century old, but for which new and important uses are being discovered every year. The explanation is that rubber and the tender skin offer practically no resistance to the flying particles of sand compared with other hard substances.

But valuable as sand is as a borer and grinder, the other uses to which it is being put today are almost without number. It is used in casting aluminum and other metals; in the manufacture of articles ranging from glass to dynamite, and is indispensable in the filtration of water and the distilling of whiskey.

All sand is from rock, either tough quartz or soft limestone, broken down and scattered, each tiny particle having within itself the substantial qualities of the original rock.

The expression "cheap as dirt" may be literally applied to sand, for the price ranges from only a few cents to a dollar a ton. Yet so enormous is the quantity used that Government statistics give $30,000,000 as a conservatie estimate of the amount annually spent on this item in the building industries alone. It is impossible, of course, to check up the amount used by farmers, small builders and others, which in all probability would add several million dollars more to the total.

The futility of trying to build one's home *in* the sand has been demonstrated throughout the ages; but building it *of* sand is one of the most substantial methods ever employed. Sand-stone, sand-



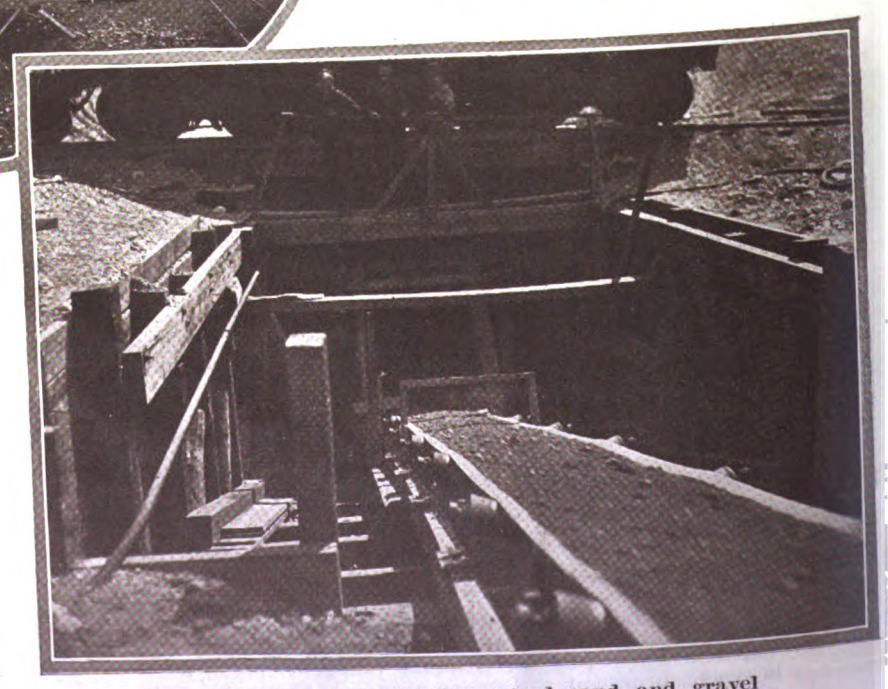
Among the lonely sand dunes on the shore of Lake Michigan.

Below—a large sand pit in Illinois: steam shovel working in the distance.





A steam shovel tearing out sand and gravel in great mouthfuls. A scene down in the sand pit.



Belt conveyor whirling mixed sand and gravel through a hopper to the belt conveyor which hurries the material to the separating mill.

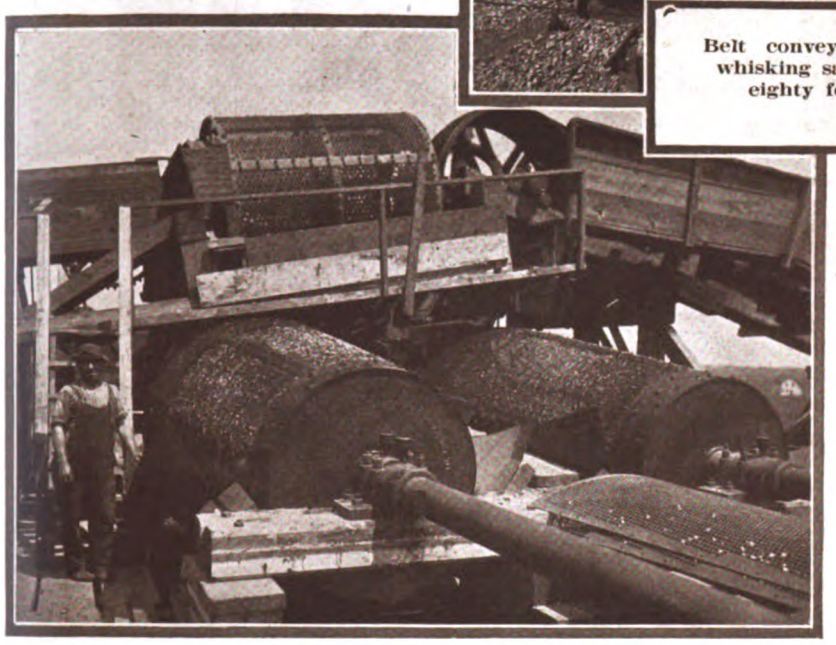
Digitized by Google

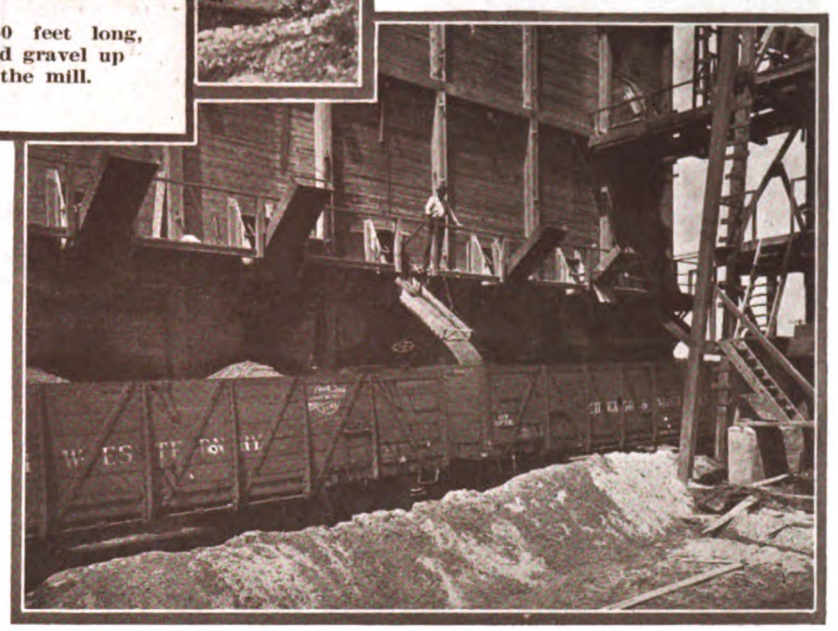
Below—Screens at the top of the mill separating the sand from the gravel. The screens are constantly revolving and streams of water inside clear the sand of all dirt.



Belt conveyor—350 feet long, whisking sand and gravel up eighty feet to the mill.

Below—freight cars taking on a cargo of sand which shoots the chutes from the separating mill.





lime brick as a building material was first used by the Germans about fifty years ago. In this country the value of this discovery has only recently been appreciated.

There are two or three well-known systems of manufacturing it. The one which has met with the greatest favor consists in putting coarse and fine sand separately through a drier and then a measuring machine, and then mixing them together. To this mixture is added six parts of lime to ninety-four of sand, water being poured in as required. The entire composition is then stored in a hopper until the process of hydrating, or slacking, the lime is complete, the time required for this being from twelve to twenty-four hours. The mixture is then ready for the presses, which are ponderous affairs, capable of exerting a tremendous pressure. In a second and a half these presses ram and crush the particles of sand into a solid mass. The bricks thus formed are then shoved into a baking cylinder where they are subject to steam and chemicals and after emerging from this double process of baking and drying are ready for the market. A sharp silica sand, derived from quartz or flint, is used in making the blocks, and mineral oxide is the chemical employed to produce various shades of pink and yellow.

The real foundation of the building industries, however, is concrete, which because of its plastic characteristics together with its remarkable strength, rigidity and imperviousness to frost and moisture and heat, when properly set, easily entitles it to this position. The best admixture is obtained from calcareous sands, or those derived from lime-stone. While calcareous sand, being soft, is for general purposes inferior to the siliceous sand obtained from quartz and flint, it makes superior mortar and concrete. This is due to the porous nature of the softer sands, the mortar not binding the grains

(Continued on Page 49)



One of its most indispensable uses—sand in Concrete.

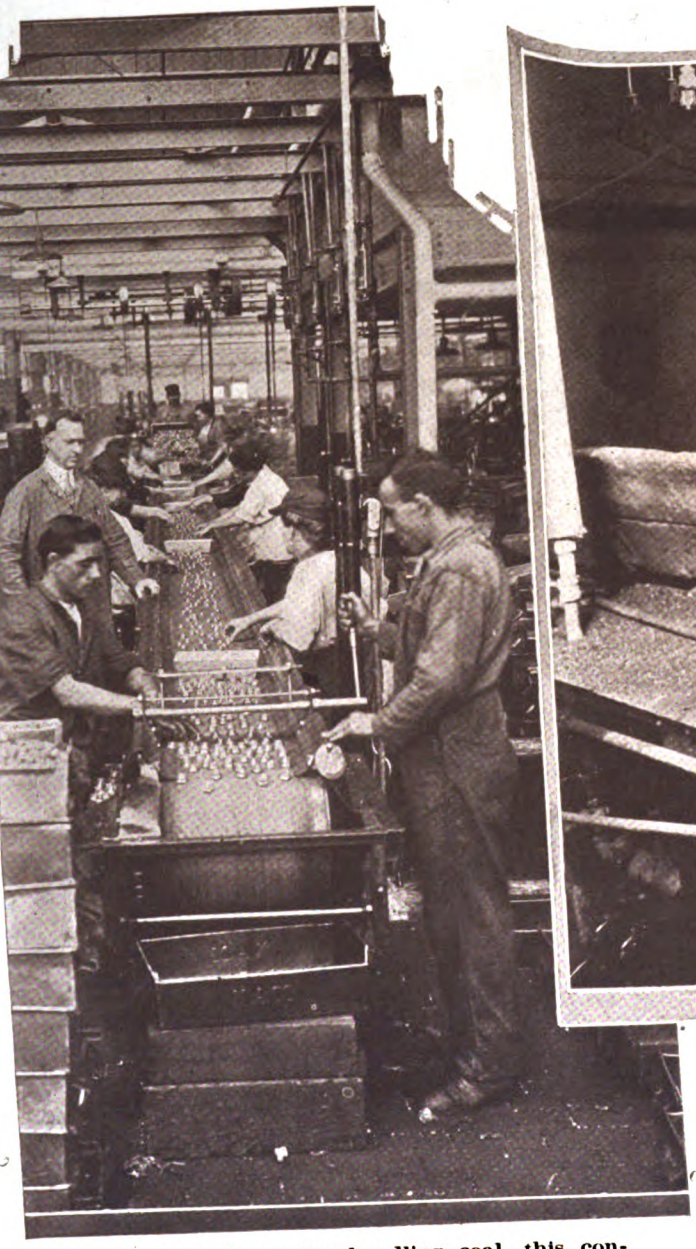


Screening sand by hand—a method used "on the job."

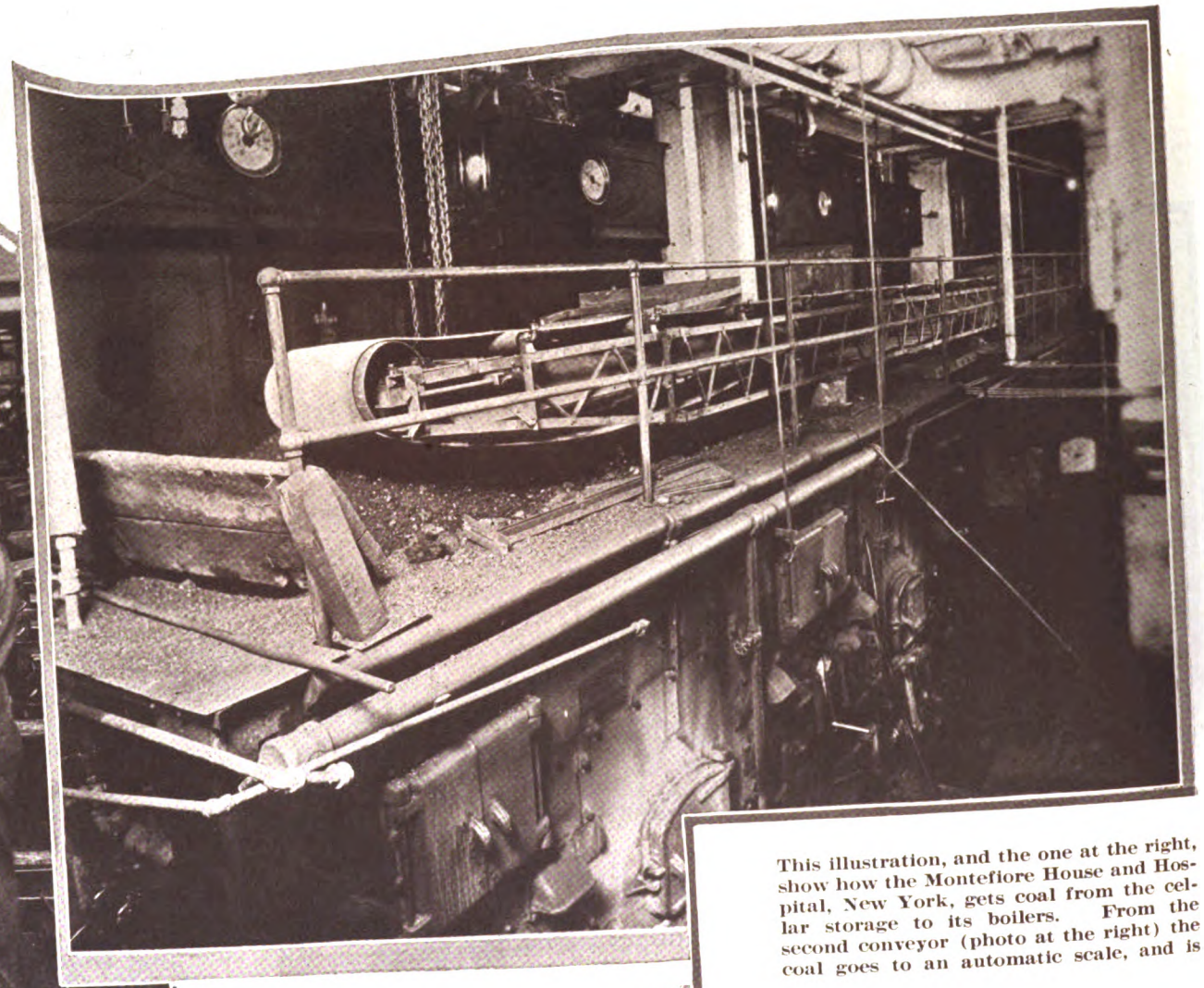
Digitized by Google

Speeding Production with

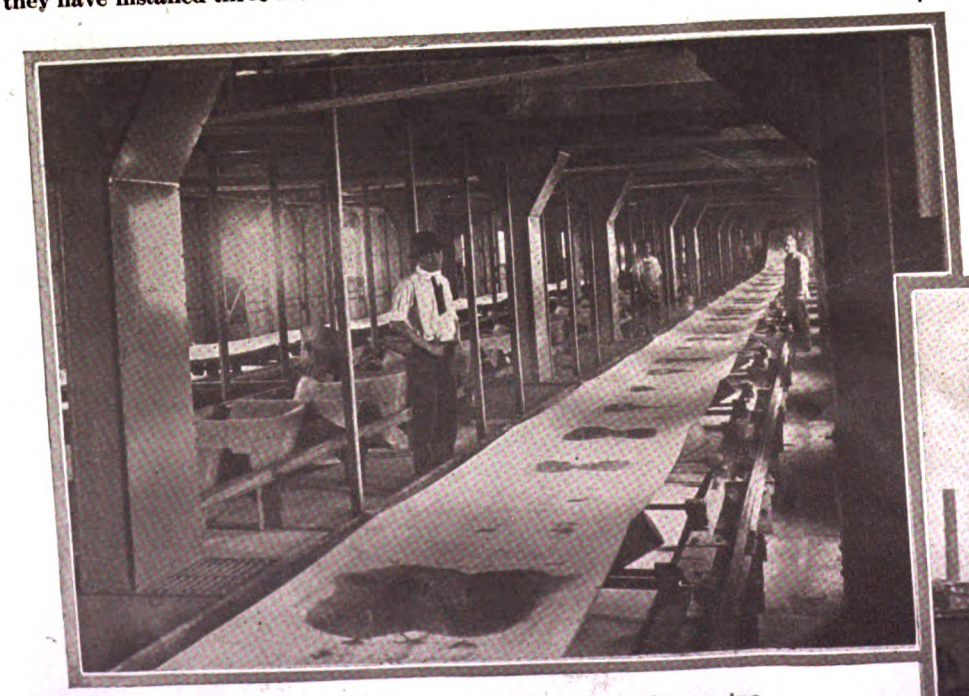
Some Dollar-Saving Ideas



Originally purchased for handling coal, this conveyor at the National Acme Co. was converted into a moving inspection table—and worked so well that they have installed three more.

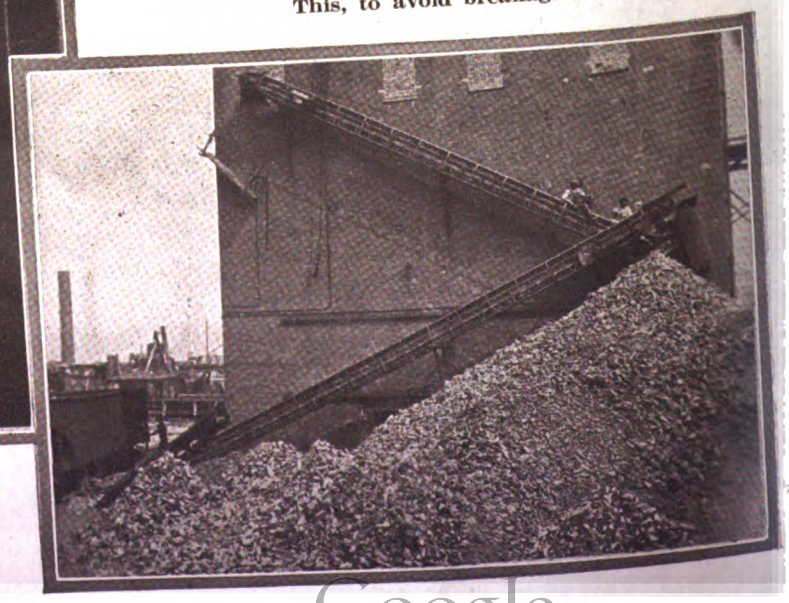


This illustration, and the one at the right, show how the Montefiore House and Hospital, New York, gets coal from the cellar storage to its boilers. From the second conveyor (photo at the right) the coal goes to an automatic scale, and is



One of the thirty-thousand-dollar belts in the marine gallery of the Pennsylvania R.R. grain elevator at Baltimore. These conveyors are a part of the most modern seaport elevators in the world, and have helped to handle the rapidly increasing traffic through the port of Baltimore.

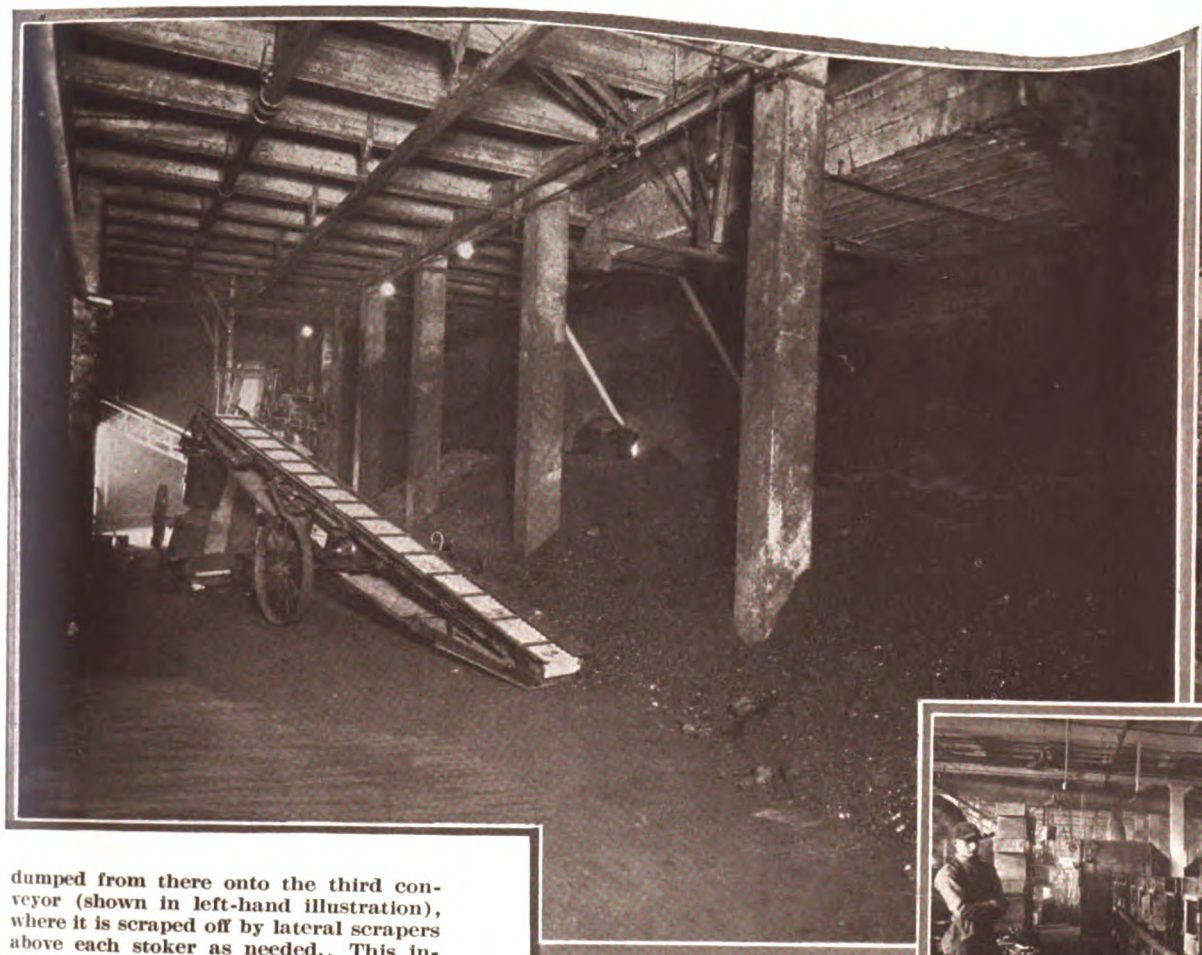
Below—A conveyor installation for handling coke, rigged with chutes so that the coke is handled without being dropped more than 3 ft. This, to avoid breakage.



Digitized by Google

Mechanical Conveyors

for the Plant Manager



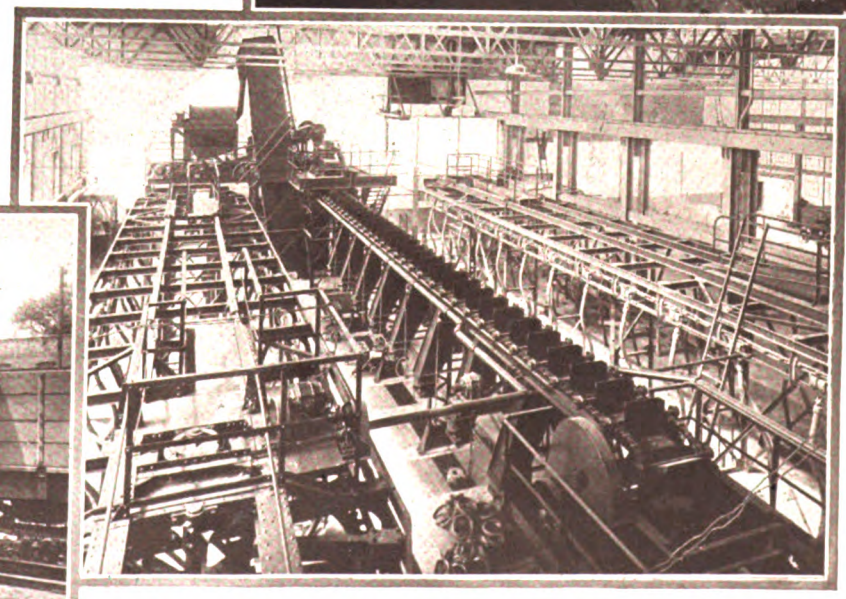
dumped from there onto the third conveyor (shown in left-hand illustration), where it is scraped off by lateral scrapers above each stoker as needed.. This installation eliminated the labor of 7 men



The two illustrations below show how the Detroit Vapor Stove Co. keep their production on the move; assembly, enamelling, drying, and crating all being done on conveyors.



At the right—a steady procession of stoves coming "down the line" at the Detroit Vapor Stove Co., where both the necessary space and the number of men required for assembly have been cut 50%.



In the foundry of the Kelsey Wheel Co., the General Superintendent asserts that these conveyors have saved ninety per cent of the floor space, doubled their production, and relieved the men of all heavy lifting and bending over the work.



The man in this illustration merely scoops the material to the end of the conveyor, instead of having to lift it. As a result, he does just four times as much work, with less effort, in a given time.

Digitized by Google

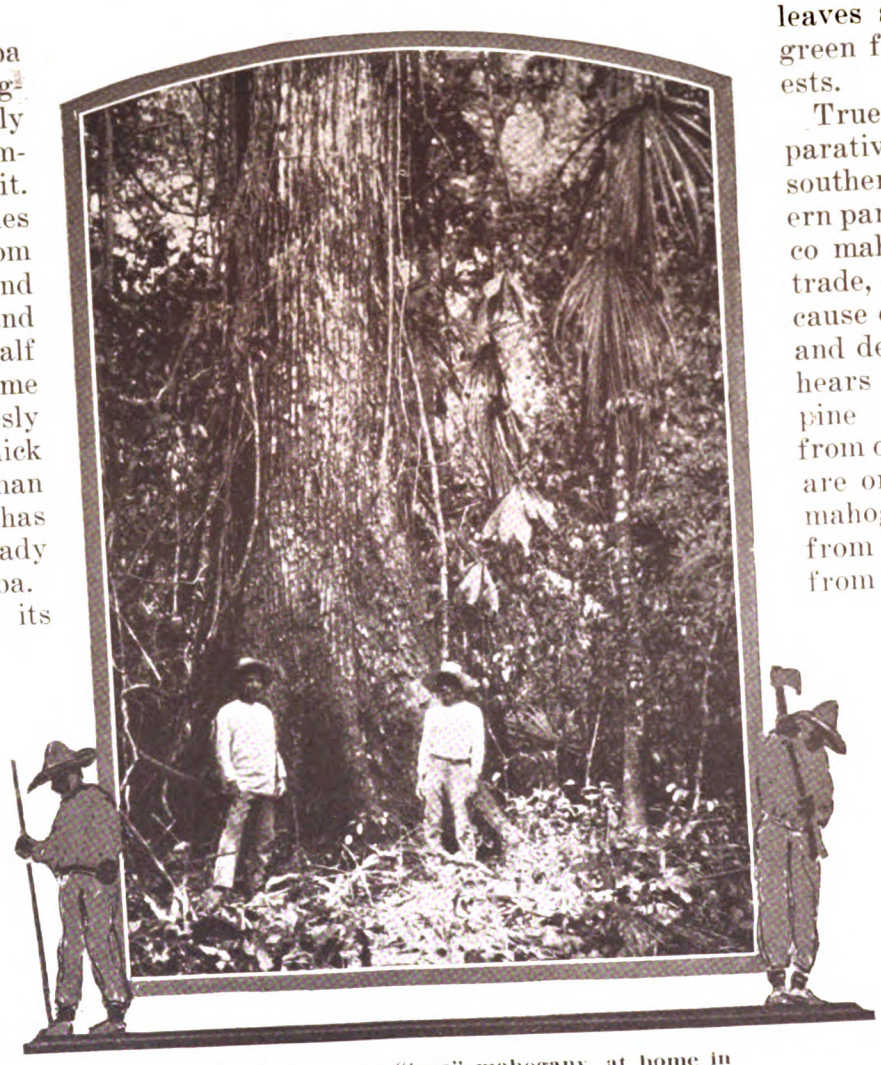
Mahogany--King of the Jungle

Picturesque, but Wasteful Methods that are Responsible for the Dwindling Supply of this Rare Wood

By H. F. Lee

CAOBA lives in the jungle. Caoba is the Spanish name for mahogany, one of the most highly prized of all fine woods. Lush and impenetrable jungle life is all about it. Palms, rubber, giant ferns, great vines —hanging like enormous ropes from tops of towering trees,—here and there the flash of an orchid, here and there powerful parasitic vines, half creeper—half tree, coiled about some respectable jungle tree, relentlessly crushing its life out! And all so thick —so unbelievably dense, that no man can pass through it until the way has been chopped out with the ever-ready *machete*. This is the home of Caoba.

Mahogany seldom grows with its kind. The single trees will be found here and there at infrequent intervals through the jungle but seldom is there a clump or grove. The tree itself is the king of the tropical jungle. Frequently it is more than one hundred feet in height and many times from 40 to 60 feet to the *horqueta*, or branching of the first limbs, the small shiny leaves standing out above the black, green foliage of the surrounding forests.



Caoba, Tabasco or "true" mahogany, at home in the jungle of Campeche, Southern Mexico. Often many hours work by the machete-men was necessary, to clear away the tangled growth and admit light for taking these photographs.

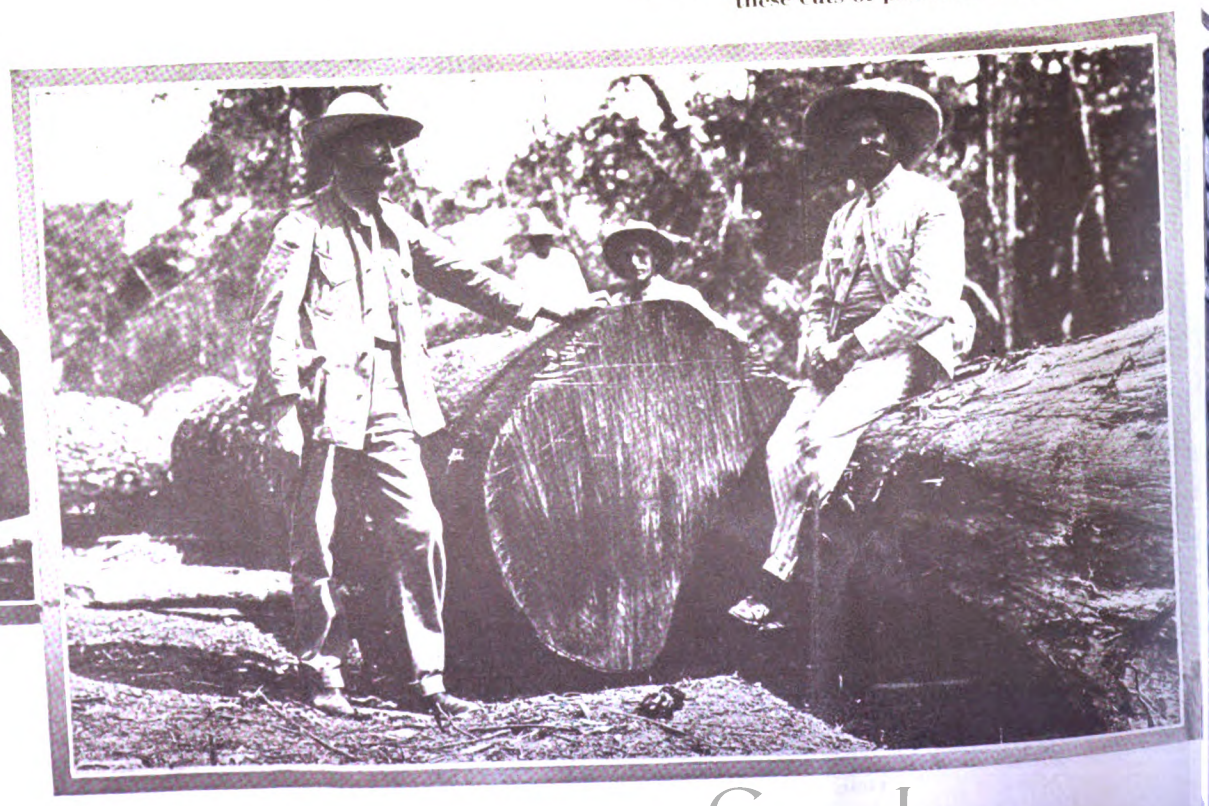
True mahogany is found in a comparatively small district covering the southern part of Mexico and the northern part of Central America. "Tabasco mahogany," as it is known to the trade, commands the highest price because of quality, size, beautiful figure, and desirable working qualities. One hears of African mahogany, Philippine mahogany and "mahogany" from other parts of the globe, but these are only distant relatives of the true mahogany and are just as different from the genuine *caoba* as you may be from your second cousin. Eucalyptus is another member of the family and is frequently spoken of as Australian mahogany.

Beautifully figured and valuable woods abound in the tropical jungle but most of them are too close-grained and hard to be worked with ordinary tools and only two or three of these rare woods can be floated out from their home place in the forest to tidewater, ships and sawmills. Mahogany has the

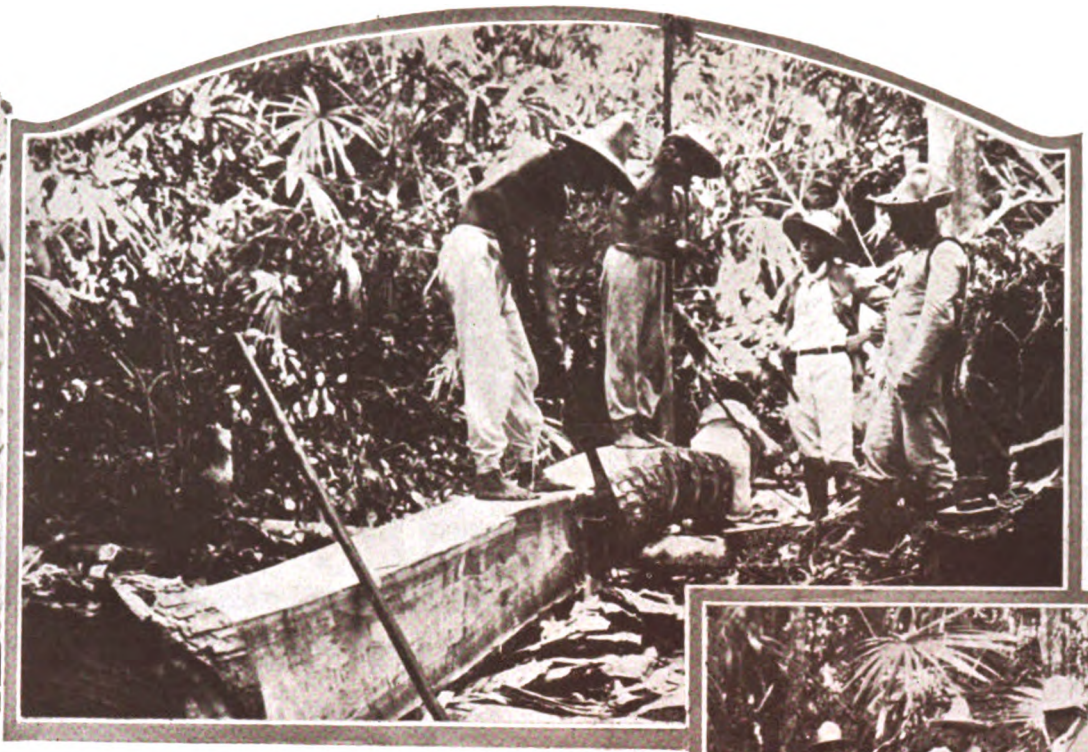


Because of the steel-hard roots, which cannot be cut by the primitive tools used, a scaffold is built some 8 to 12 feet high, from which the cutting is done. Much valuable timber is wasted, as the mahognay stump is noted for its fine figuring.

Great mahogany logs as they have been cut in the jungle of Campeche. Photo shows size of these cuts of precious hardwood.



Digitized by Google



When the workmen have felled the mahogany tree they at once "square" the log so that it has the same thickness throughout its length. This is another highly wasteful custom and sacrifices at least 30% of the tree. The custom originated in the old days when mahogany was plentiful and cheap and when the owners of schooners preferred the square logs in trimming cargo.



After squaring the mahogany log, it is covered with the slabs that have been hewn off and then left in the woods until the dry season, by which time it has cured or dried to a point where it will float.

remarkable qualities of being light enough to float, soft enough to work easily, close-grained enough to take the wonderful finish for which it is prized, and yet, withal, beautifully ribboned or figured.

The Mahogany Spy

The mahogany prospector or "spy" goes into the jungle armed with field glasses, climbers, rope and accompanied by a "cuadrilla" of *mozos* as helpers. Once in the mahogany country he selects the tallest tree to be found, climbs up into the topmost branches and then, with his glass, locates the *cæoba*

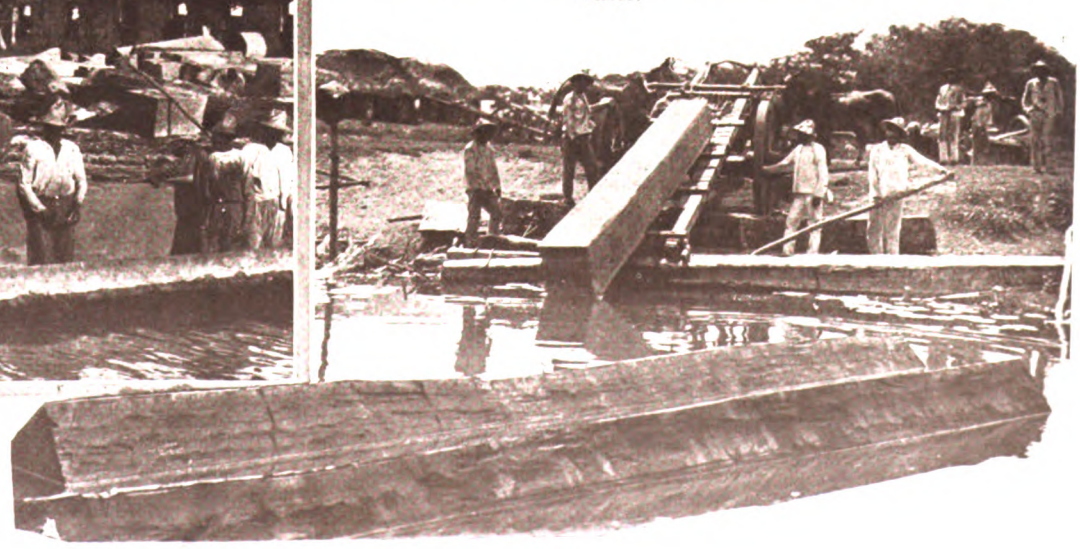


The lush, matted jungle of the south woods is divided by a small pathway overhung with dense foliage. Through these narrow alley-ways the logs are "snaked" from the forest on clumsy, two-wheeled balancing carts, called "trinquivales."

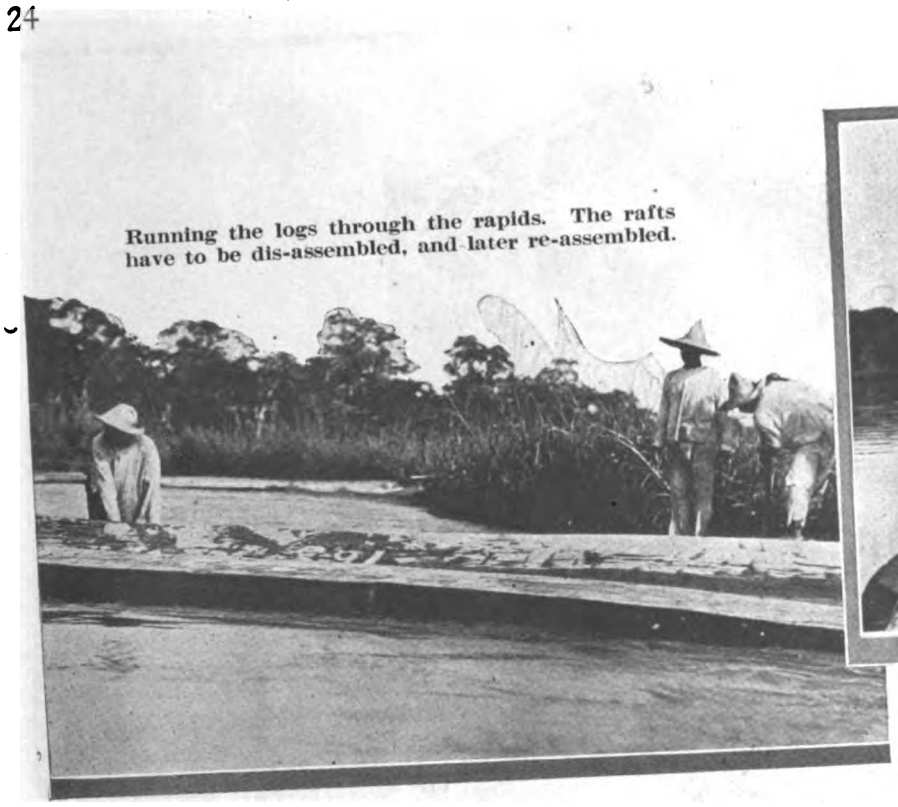


La casa grande, the owner's home, always on the bank of one of the many navigable streams, is often ten to twenty miles from where the trees are cut. It is here, in front of the hacienda, that the logs are dumped into the river.

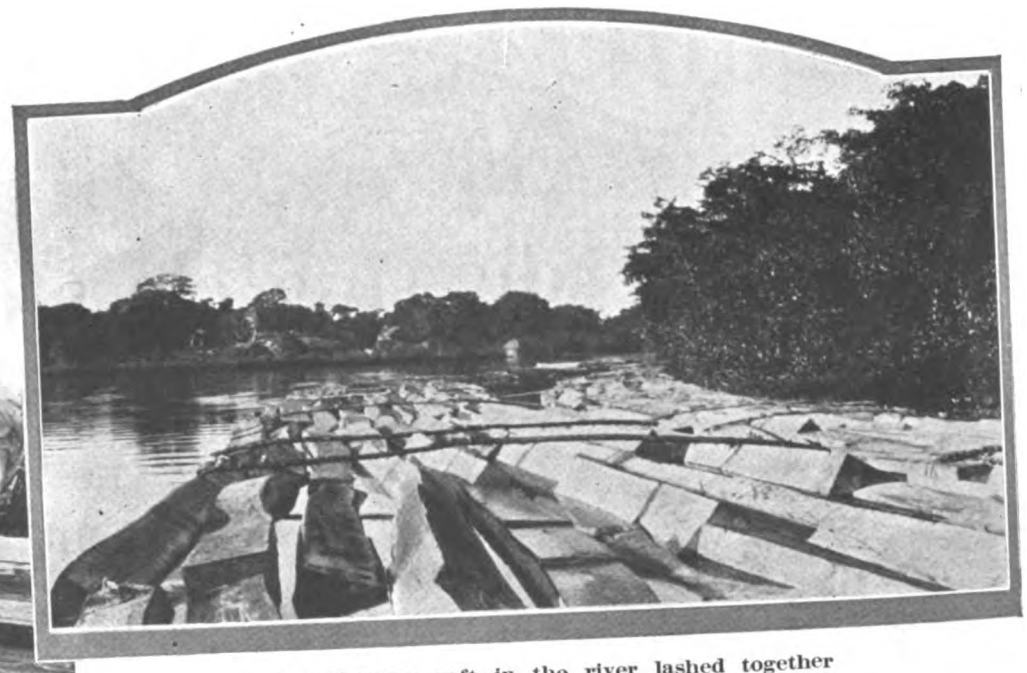
Beginning the second stage of the long journey to market. Note the roughness of the squaring of the log in the foreground—a source of great waste.



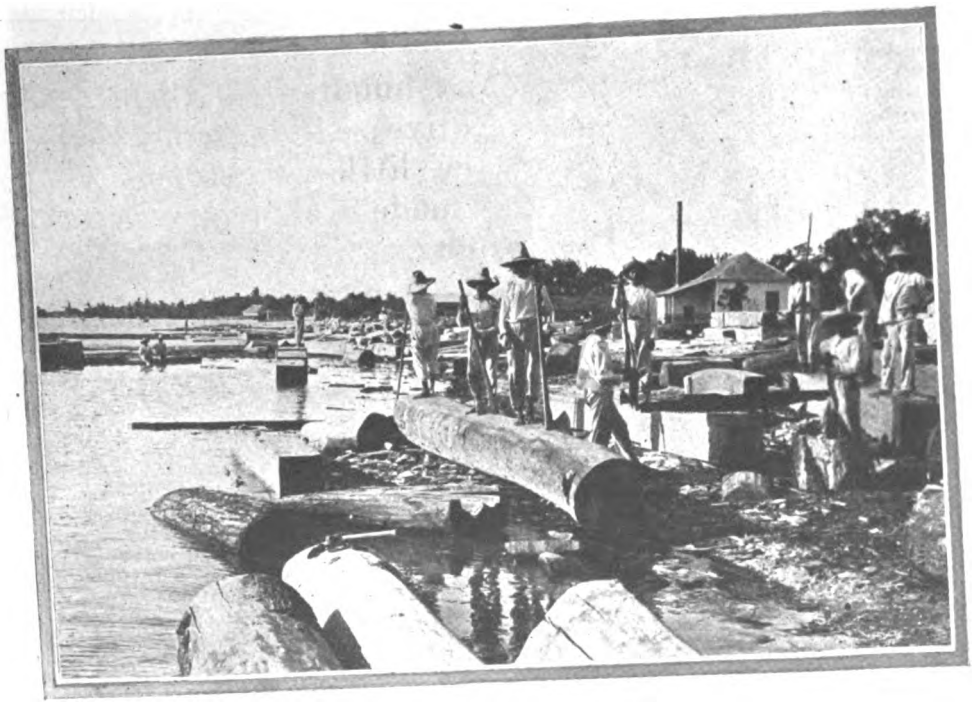
Digitized by Google



Running the logs through the rapids. The rafts have to be dis-assembled, and later re-assembled.



A mahognay raft in the river lashed together with huge, tough vines.



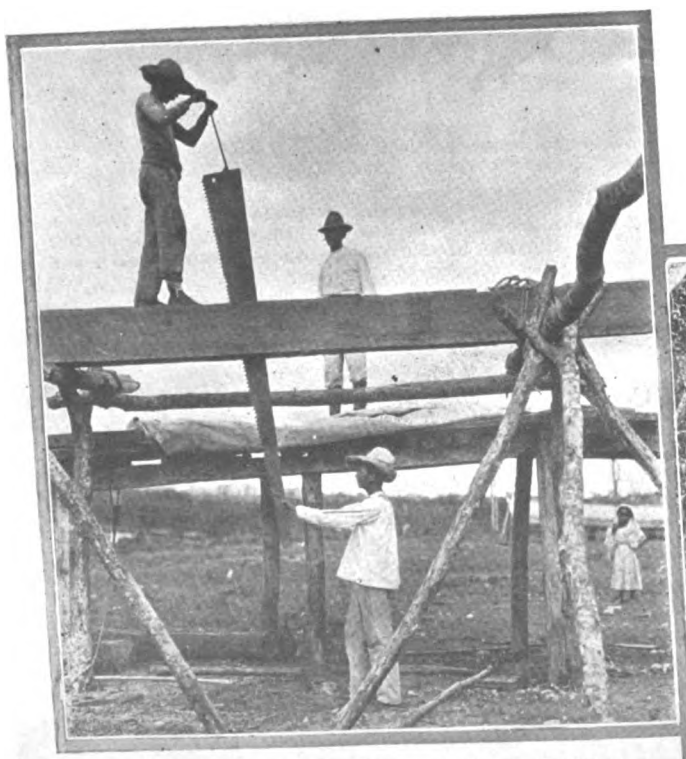
Re-hewing timbers, cutting out split or damaged ends and preparing the mahogany logs for shipment at Laguna del Carmen, Campeche.

covering the space of a circle some two miles in circumference—a wheel, of which his tree is the hub. Having determined that there is a sufficient "stand" to warrant cutting, camp is pitched, the mahogany cutters are brought up and work begins.

Felling the Trees

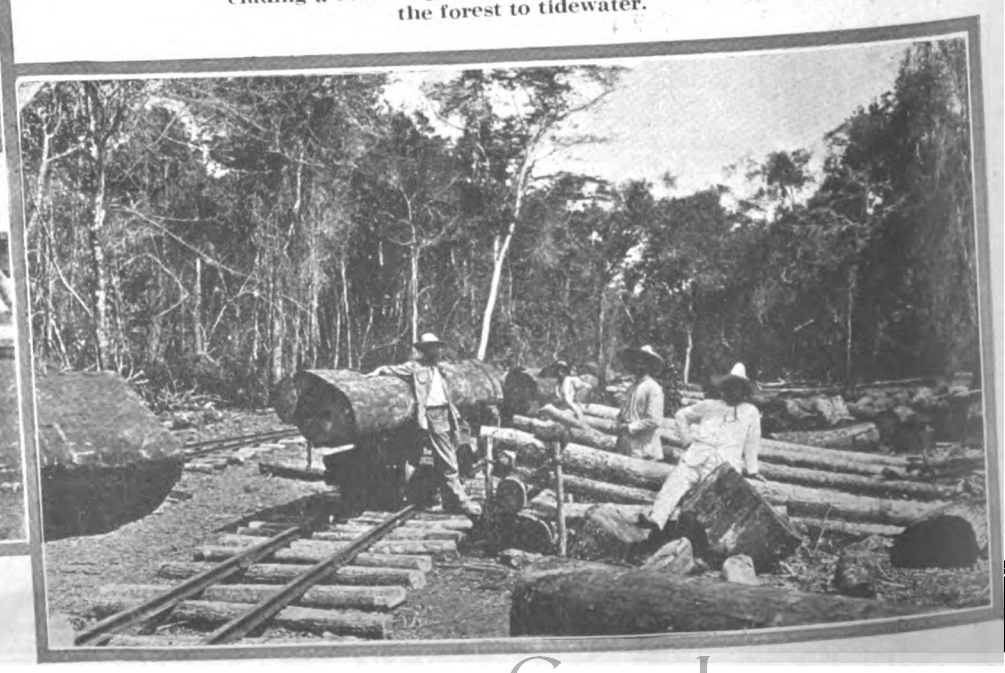
The mahogany cutter is generally a tropical Indian armed with a very long handled mahogany axe and a *machete*. The cutting is usually done during the rainy season or, if done during the dry period, the *trozas* are allowed to remain on the ground almost a year or until the next dry season, during which time they have had opportunity to cure. The cutter will first expend much hard work in clearing away a small open space along the line where

(Continued on Page 54)



A primitive sawmill. Cutting mahogany planks for house-building.

One or two large mahogany operations are conducted by American lumbermen using modern methods, including a narrow-gauge railway to haul the logs from the forest to tidewater.



Digitized by Google

What the Dean said to a graduating class of engineers

THE DEAN of the engineering department of a certain university has had a hand in training a very large number of eminent engineers. He has taken a personal interest in following them after their graduation; he has analyzed the reasons for their failure or success.

To last year's graduating class he gave this parting advice:

"The first thing for you to do, gentlemen," he said, "is to get the facts about the Alexander Hamilton Institute's Modern Business Course and Service."

Why should he say it?

Rather an unusual recommendation from the Dean of a school which sends men into life equipped, theoretically, with everything they need. Why should the Dean give such advice? What lies behind it, in his mind?

Simply this. His observations have convinced him that specialized training, which is so great an asset at the beginning of a man's career, can become a positive liability as the years go on. Again and again you find the specialist in a subordinate position, while at the head of the business is a man who may know less about the particular departments than the department heads, but whose *all-round knowledge of business* fits him to direct their activities.

"I was lucky," said this engineer

Some months ago an important engineer enrolled for the Modern Business Course and Service. "I was lucky," he said. "I got in with this big organization early and have been carried along by its growth into an executive position. If the directors were filling my position today, however, they would choose a business man and give him an engineer as an assistant."

The Alexander Hamilton Institute was founded by a group of successful business men; its purpose was to carry executive training to men in commercial and industrial life.

But the Institute's service has broadened and extended far beyond the original conception of the founders. Of the scores of thousands of men enrolled, one out of every ten is a man of technical training. The need which technical men have felt for knowledge of costs, accounting, sales, merchandizing, advertising, and corporation finance, has caused them to reach out, on their own initiative, to the Institute.

And hundreds of them are in executive positions today because of the little investment which they made in this very practical training.

A book worth sending for

The facts about the Institute have been condensed for busy men into a book of 118 pages called "Forging Ahead in Business." It is a valuable book for any business library, and enough copies have been printed so that every reader of this magazine may have one. The Institute's training may be the one thing that will mean increased earning power to you. If it is not for you, it may be of inestimable service to one of your younger associates. In either event we should like to have you know what it is and does. The book will come without obligation to you immediately upon receipt of your request.

Alexander Hamilton Institute
582 Astor Place, New York City

Send me "Forging Ahead in Business" which I may keep without obligation.

Name .....
Print here
Business Address .....

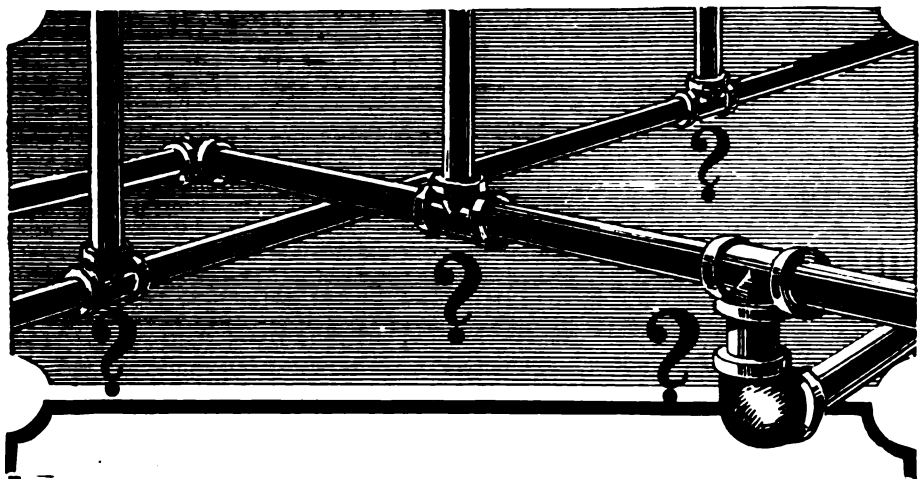
.....

Business Position .....

Canadian Address, C. P. R. Building, Toronto; Australian Address, 42 Hunter Street, Sydney

Copyright, 1922, Alexander Hamilton Institute

Digitized by Google

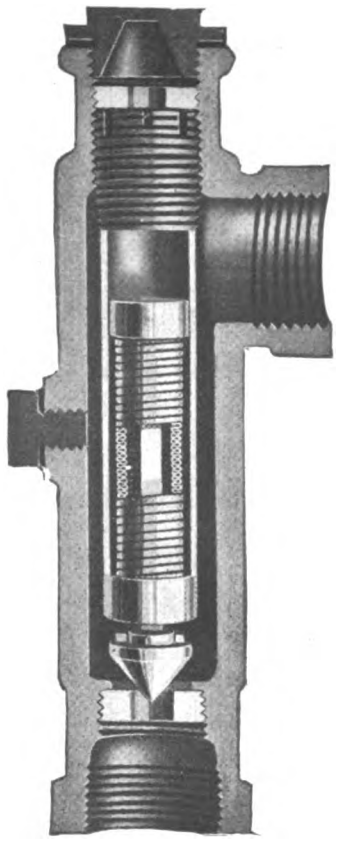


You're Wasting Coal If Your Steam Lines Are Not Thoroughly Trapped!

Because of the high cost of the "bucket" or "float" type of steam trap, many large plants are not equipped with a sufficient number of traps to take care of the condensate properly. A pretty poor policy, and one that is likely to prove very costly with bituminous coal selling up to $17.00 a ton.

To be properly trapped—and that means economically trapped—a steam system should have a trap at every point where condensate collects.

The low price of the Steam Trap Sarco enables you to buy three traps for the cost of one of the bucket or float type. In that way you can equip your lines with as many traps as are needed, at a low figure, and in that way save many tons of costly coal.



And that is not the only advantage of this trap. Built on the liquid expansion principle, it is free from the complicated mechanism found in other traps—mechanism which will get out of order and cost you money for repairs.

The Sarco closes promptly and prevents all loss of live steam. It returns condensate to the hot well while still hot.

Can be installed without supports or platform.

There are other exclusive features of a money-saving kind which recommend the Steam Trap Sarco. These are fully described in our Booklet R-13. Write today for a copy and information about our free trial offer. No obligations.

SARCO CO., Inc.

236 Broadway, New York City.

Ellicott Square, Buffalo
Monadnock Block, Chicago
1145 Griswold St., Detroit
Drexel Building, Philadelphia
7016 Euclid Ave., Cleveland, O.



Getting One Hundred Cents Out of the Power Dollar

(Continued from Page 17)

portance. You can then use the same kind of reasoning you apply to your car, and tackle the most important points first. This method of analysis and correction enables you to put into effect the biggest items of saving first and you can then afford to work out the smaller refinements more slowly.

"Chimney Loss is the greatest of all the losses in connection with boiler plant operation. It is technically called "Dry Gas Chimney Loss" since it represents the heat carried away from the boiler by the dry portion of the escaping gases of combustion; the "wet" portion being the superheated steam from the burning of hydrogen, from the moisture in the air supplied to the combustion and from the moisture in the coal as fired. In our cost cutting program the "wet" portion as already implied is a non-preventable loss and extremely small. So when we speak of Chimney Loss we mean the "dry" part of it and that simplifies our work.

"The chimney loss is a simple thing to comprehend. Everybody knows the heat goes up and out of the chimney, and that this heat is carried by the hot gases leaving the boiler, and that these gases have received their heat from the coal that is burned under the boiler, and hence this heat is a loss.

"Now, how to reduce this chimney loss? That too is really very simple. The amount of heat these waste gases carry away depends upon the volume or weight of the gases and the temperature to which they have been raised. Hence to reduce the loss you must reduce the quantity of gases that go up the stack, or their temperature, or both.

"To reduce the quantity of gases it is only necessary to reduce the amount of air to the economic minimum; that is to the point where there will be just enough air to give complete combustion of the fuel and no more. Any air in excess of this quantity takes heat from the fuel and carries it up the stack as needless waste, instead of allowing this heat to become absorbed by the water in the boiler. This excess air, which causes the greatest single waste of fuel in boiler operation, enters and increases the weight and waste of the flue gases in two ways. First through the grate (or stoker) of the furnace and secondly by leakage through the boiler setting at points between the furnace and the uptake.

"In many cases *as much air will leak through the brick setting as will enter through the grates and fuel bed.* This wasteful leakage of air occurs to some extent through good brick work showing no cracks or imperfections. It occurs at joints between clean-out door flanges and brick work, through doors that do not close perfectly, through all bad joinings of brick setting to boiler headers, shelfs and drums. Study your boiler setting to locate all such joinings. A good way to demonstrate air leakage is to cover the fire with soft coal to produce heavy smoke. Then quickly close the uptake damper. The smoke will spurt out through the leaks. Another way: take a candle or small torch and play the flame closely over all suspected and unsuspected areas. Go on top of the boiler as well as around the four walls with your testing. A vulnerable location for infiltration is the joining of the front header of a water tube boiler with the brick work. Similarly between the shell of a horizontal water tube boiler and the front wall.

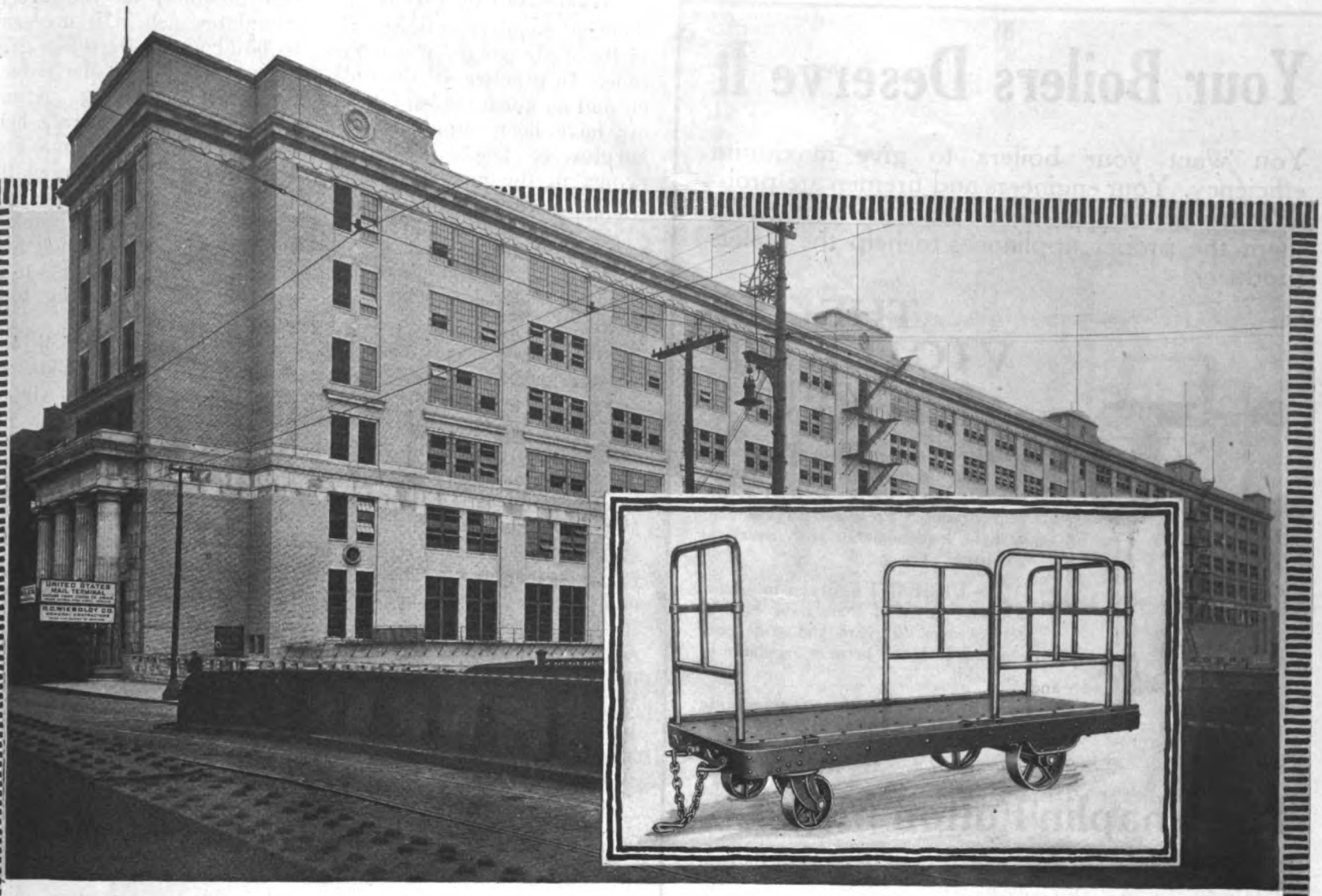
"Having located the air leaks, stop them. Plug up the big cracks with waste soaked in asbestos mortar. Use mineral wool around headers. Then coat the boiler walls thoroughly with one of the several air-tight plastic coverings which can be purchased at moderate cost. Overhaul all cleaning and access doors for tightness of closing. It pays to use the air-tight type of door with gaskets and clamps.

"Having done these simple, common-sense things you will have eliminated part of the waste fuel due to excess air chimney loss which is very often found.

"For perfect combustion the

(Continued on Page 28)

Digitized by Google



The New Chicago Railway Mail Terminal uses more than a thousand K & J Trailer Trucks

On big installations, where carrying costs must be figured to the last notch—where the work to be done is so large that the effect of even very small shortcomings of equipment would be multiplied, through day in and day out service, into huge annual wastes—on installations such as this, "K & J" Trailer Equipment has demonstrated itself to be safest.

In this great, new Chicago Mail Terminal, over eleven hundred "K & J" Trailers and Trucks are being installed to meet the initial needs of this huge modern plant—a plant of national importance, designed for the quick, efficient handling of mails in this vital center of mail transportation.

The trailers, of the type shown, are of 4000 lbs. capacity, having a 36"x84" platform. Rear wheels have individual axles.

These trailers are equipped with Hyatt Roller Bearings, with ball bearing caster swivels.

The experience developed by the "K & J" Organization, in meeting the exacting needs of such large installations through many years of truck and trailer building, is ample assurance of its unrivalled fitness for taking care of all classes of truck and trailer requirements, either large or small.

Write for Bulletin 510.

TRADE MARK

THE SEAL OF SATISFACTION K&J REG.

The Kilbourne & Jacobs Mfg. Co.

COLUMBUS, OHIO, U. S. A.

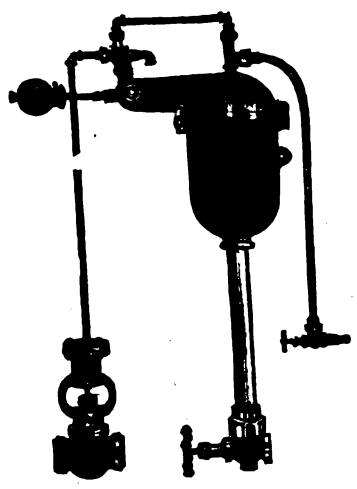
New York, 120 Broadway

Connections in all parts of the world.

Digitized by Google

Your Boilers Deserve It

You want your boilers to give maximum efficiency. Your engineers and firemen are probably trying their hardest. But, are you giving them the proper appliances to help the boilers produce?



THE VIGILANT FEED WATER REGULATOR

will help the men in obtaining maximum output at the minimum coal consumption. It keeps the water level at the proper point. It responds to peak load or light load demands with equal regularity.

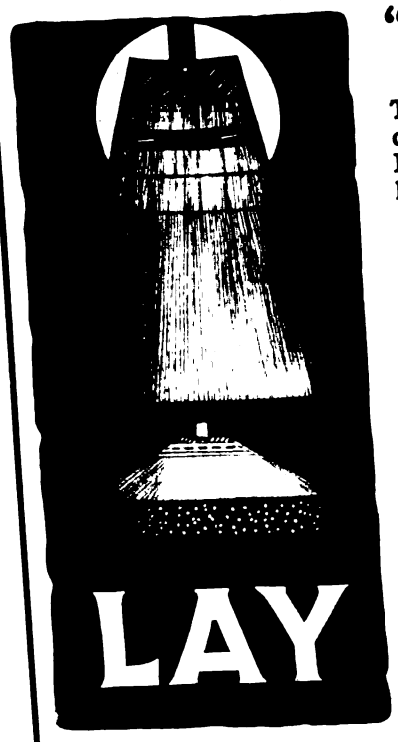
The VIGILANT has been in use for 25 years—some of them have been in service over 20 years and still going strong. It is the premier regulator in the field.

Write for our Catalog. It gives some interesting facts on Boiler Feed Water Regulation.

The Chaplin Fulton Mfg. Co.

28-36 Penn Ave. Pittsburgh, Penna.

LAY BROOMS



"They Wear to a Stub"

The Staple Metal Case and machine made feature of LAY BROOMS is a guarantee of the lasting quality.

LAY BROOMS have been on the market for 44 years and have been used for every industrial purpose.

Performance records prove their absolute economy—every broom is unconditionally guaranteed.

If you are interested in bringing down the costs of your sweeping expense, sign the coupon below and mail it in to-day. We will advise you about the type most suitable for your work.

The Joseph Lay Co.

Incorporated

Grant and College Street
Ridgeville, Indiana

Metal Case Brooms
Bench Brushes Casting Brushes
Street Brooms Hickory Fibre

Please send information regarding the brooms most suitable for the following:
Floors—Wood, Concrete, Brick, Composition, etc.

Name .....

Company .....

Address .....

(*Continued from Page 26*)

chemical requirements are 11.47 lb. of air per lb. of combustible. In practice we shall often find as much as 34.87 lb. of air have been supplied, or a surplus of 203.5 percent as shown in the next column to the left. Now if the temperature of the gases leaving the boiler is 600 degrees F., the chart shows the chimney loss to be 28.5 percent of the combustible.

"If now we succeed in reducing the excess air to a point where we are supplying say 17.6 lb. of air per lb. of combustible the chimney loss with the same flue temperature will have become only 14.5 percent. We have, therefore, added (28.5 — 14.5), 14 percent to the former efficiency as based on combustible consumed. Thus if the old efficiency was 55 percent, it will now be (55 + 14), 69 percent and (a) we shall be making (14/55) = 25.4 percent more steam for the same fuel; or (b) burning (14/69) = 20.3 percent less fuel for the same amount of steam as previously.

"This is enough for the present to show the importance of reducing air supply to the correct proportion. Now we must continue with the story of how to reduce the air to the proper minimum and how to *know* when we have reached that point.

"As already stated, the surplus air enters (1) through leakage or infiltration and (2) through the grate or furnace and fuel. We have discussed the first and shown how to stop this part of the trouble. Now for the second.

"Too much air enters through the fire bed from the following causes. (1) Holes or thin spots in the bed of fuel on the grate. The cure for this is to keep these holes or thin spots covered with fuel. Firing large lumps of coal with slack or fines tends to produce an uneven fire with holes. Therefore break up the large lumps before firing. For stokers, all coal should pass through 3-inch mesh. Carrying too thin a fire will permit the quick and easy formation of these undesirable holes and spots. Therefore, carry it a little thicker and watch it carefully. Six to eight inches thick for a soft coal fire is a good general rule which has, however, several exceptions. One instance, as the fire accumulates ash it is necessary to build up its thickness gradually until it can be reduced again after cleaning. A good design of shaking grate helps to keep the ash cut out from the bottom of the fire so that it need not be built up to so great a thickness. Stokers, both hand operated and automatic, add modifications to the general rule according to design.

"(2) Clinkers which have formed in the fire while cutting off a part of the air supply tend to form holes near their edges and thus admit streams of excess air. The cure is to keep the fires clean. Often a change of coal will help, a coal having less ash and ash with a higher fusing point. It always pays to take the trouble of making a survey of the coal market. Frequently a better coal can be bought for the same money. Clinkers are formed by the bad practice of stirring the fire up from the bottom. This brings the ash up on top where the higher temperature causes fusing and clinkering. Sometimes a little exhaust steam admitted below the fire will reduce clinker formation.

"(3) Too strong a draft. Reduce the force of draft by partly closing the uptake damper. This applies to either "forced draft" or natural draft. In the case of mechanical or forced draft regulate the blower speed to give the pressure required to furnish the necessary air; then adjust the uptake damper, throttling the natural draft down to a point which will produce a slight vacuum in the furnace, or atmospheric pressure if it does not cause too rapid burning out of furnace linings.

"These three causes and cures of excess air through the grate and fuel bed all relate to good firing and good control of combustion. A good fireman is worth his weight in coal about three times an hour as compared to a poor fireman. I have plenty of figures to prove this. But the good fireman needs help and encouragement from headquarters. Let me now add the following warning. Heavy firing at long intervals means insufficient air immediately after firing. Then before the next firing the fuel bed has be-

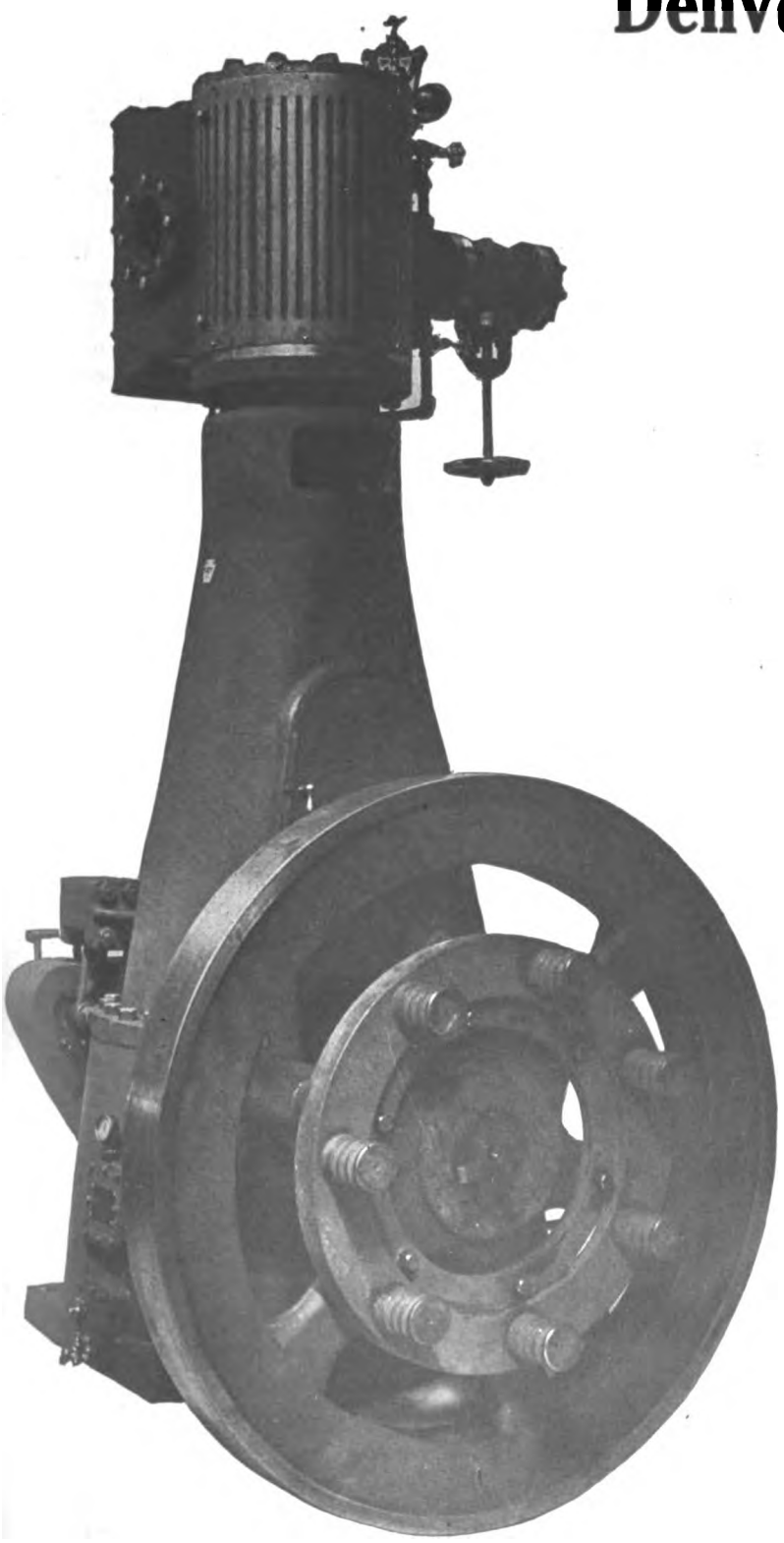
(*Continued on Page 30*)

Digitized by Google

TROY ENGINES

ONLY STEAM ENGINES — GOOD ENGINES ONLY

Deliver More Brake Horse Power
with the Same Steam Consumption



COMPACT and symmetrical in design with steam-tight, nicely balanced valves that prevent leakages and breakdowns, these sturdy small size steam engines are everywhere meeting exacting and severe demands.

TROY ENGINES are the most economical steam engines for stokers, ventilating fans, as auxiliaries to the larger power units and in the out-of-the-way places where engines that require minimum maintenance are used.

In many plants they have eliminated the use of pulleys, belts and line shaft extensions with their enormous transmission losses.

An exclusive Troy feature is the Automatic Oiling System. All bearings are continually supplied with an abundance of oil, which keeps all bearings clean and reduces wear to the minimum.

These features assure long life and **greater Brake Horse-Power with the Same Steam Consumption.**

It will pay you to have a copy of our booklet in your files. It describes the various types of TROY ENGINES which are built in sizes from 2 to 200 B. H. P.

Send for it today.

TROY ENGINE & MACH. CO.
TROY, PENNSYLVANIA

Digitized by Google

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width	$10.68
9½ " "	11.93
11½ " "	14.00
12¼ " "	15.45
13 " "	16.00
14 " "	17.59
15 " "	18.84
18 " "	22.00
18¼ " "	22.90
24¼ " "	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. ***Our Customers will benefit.***

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company

(An Independent Corporation)

ROCHESTER, N. Y.



(Continued from Page 28)

come thin and full of "spots" and holes which mean another and usually greater waste from too much air. So the poor fire alternates all day long from a condition of feast to a condition of famine, which is unhealthy for the coal pile and the pocket book. The automatic stoker is designed to overcome this difficulty and sometimes does it almost completely. Hence good hand firing must at least approximate this ideal, which means frequent firing in small amounts.

"Now we have seen how to go about the job of cutting down surplus air and how great an effect this may have in reducing the largest waste in connection with boiler operation. By this time, however, someone in the audience will have asked the question. "Isn't it possible to go too far in reducing the air supply?" and I shall have answered, "Yes, sir, it is." "Then how do you know when you have reached the economic limit?" Then like the professor I say, "I am so glad you asked that question." For its answer is the next logical step in our program. And the answer is this. Reduce the air supply down to that point beyond which the combustion becomes incomplete. As the air supplied per pound of combustible is reduced the CO_2 found in the products of combustion is correspondingly increased. In boiler practice we can not very closely approximate the bare chemical air supply. We must give additional air in order to insure contact between the oxygen molecules and those of the fuel gases. The minimum amount of surplus air we must thus furnish depends upon how nearly furnace design and operation approach perfection. Prof. Bone with his surface combustion did approach this perfection closely with a correspondingly high boiler and furnace efficiency.

"Fifteen percent CO_2 is a good mark to shoot at. You may have to stop cutting down air supply before you reach that point or you may with certain equipment and fuels somewhat exceed this high mark. In any event go as high in CO_2 as you can without producing unburned gases. The best indication of unburned gases is the presence of CO as detected by an "Orsat," with which you may also determine the CO_2. I shall not describe the Orsat Gas Analyser, nor how to use it. You can find out by reading some good literature on the subject, or by consulting your technical men. The point here is that you ought to know how useful a $25 Orsat is for checking up the combustion and regulating the firing for proper air supply.

"There may be other unburned gases besides CO in the flue gas. There might be unconsumed hydrocarbons and hydrogen; the former particularly in the case of very weak draft, heavy firing of soft coal and insufficient combustion space when these conditions will probably be accompanied by heavy smoke. These other gases are difficult of determination, which is unnecessary in our present program.

"The point to be absorbed here is simply the fact that a very small amount of CO in the products of combustion neutralizes the good effect of additional percentages of CO_2. Hence as before advised, run your air supply down and your CO_2 up until you begin to get traces of CO and then stop. Further improvements must then come from better furnace design.

"The remaining factor in Chimney Loss is the temperature of the flue gases. This should be kept as low as possible. With this object in view the following suggestions should be of service:

"1. Be sure there is no short circuiting of the products of combustion. The gases must traverse the complete path of the heating surface. With horizontal tubular boilers the fire gases sometimes find their way directly to the uptake or smoke breeching through holes in defective front arches and through a burned extension front. Inspect this locality.

"In a water tube boiler, be sure the baffies are all in good repair; otherwise you are the loser.

"The boiler heating surface must be kept clean inside and out. Scale and sludge and mud occur inside on account of impure water.

"Soot and dust accumulate outside and must be systematically removed. Mechanical soot blowers should be used in every case where they can be successfully applied. And remember, it's no use blowing

Digitized by Google

tubes upon which the soot has become caked. They must be thoroughly cleaned first. You must start with clean tubes. If you will remember that *a coating of soot is equivalent to five times its thickness of asbestos* in keeping the heat out of the boiler you will certainly be encouraged in your efforts.

"Scale and sludge and deposits from impure feed water on the inside of the heating surface form the subject of a very special problem involving much technical information, so involved, that present space forbids its treatment. But you must keep your boilers free from scale because it causes burning and bagging of tubes and sheets and is an element of danger as well as of waste. If you are up against this problem my advice is, consult some competent authority.

"Another cause of high flue temperature is over rating of the boiler; that is to say, burning so much fuel that the heating surface is unable to absorb its proper part of the heat developed. The average plant, however, does not have this difficulty. On the contrary, the average plant operates too many boilers at too low a rating for the best results. No hard and fast rule can be given. In general it pays to operate at 125 percent to 175 percent of nominal boiler rating. There are special conditions where 300 percent and even higher is justified."

* * * *

Recent developments in the burning of oil instead of coal under boilers, lead naturally to a consideration of this subject. With the present prices of coal and oil, there are cases where a change from the former to the latter fuel may prove economical.

Again, when we begin to compare the cost of coal fuel and oil fuel, for burning under boilers, the important thing is the cost per B. T. U. And from the power angle, we must go further than merely to consider oil as a fuel for steam gènera- power plants today. Recent tion, because the internal combustion engine provides another—and important—path from oil to power. Although neither water-power nor oil—nor both combined—can at present supplant coal as the backbone of our power program, they can, and must, supplement it.

To round out this series of articles on power, then we will take up in succeeding issues the consideration of fuel oil handling and storage, the use of oil as a fuel for steam generation, and the various types of oil engines; in each case showing, as in previous articles, what is actually being done today.

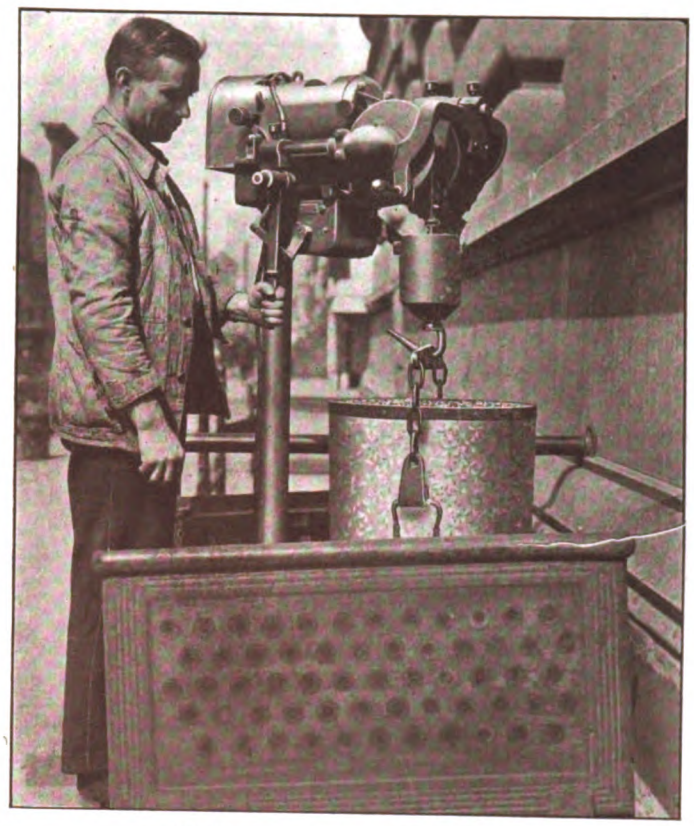
Night in the Steel District

(*Continued from Page 13*)

The name "Steel" as it is used today has a different meaning from that originally understood. About the time of our Civil War, there were wrought iron, which was almost free from carbon; steel, whose carbon content ranged from three-tenths of one percent to about two and one-fifth percent; and cast iron, whose carbon content was so large that it was too brittle to be worked at any temperature. The best class of steel was known as crucible steel, because it had been freed from slag by melting in crucibles, and was commonly referred to as "cast steel."

Since all the other varieties of iron (iron being the inclusive term, because steel and iron are different only in degree) contained a good deal of slag, "steel" became associated with purity and quality in the product. As a consequence, when the invention of the Bessemer and open-hearth processes introduced a product free from slag, although this actually was iron—rather than what was then understood by "steel" — the manufacturers claimed that it should be called by the latter name because it resembled steel in purity; even though it lacked the essential characteristic of taking a temper.

It is from the date of the invention of the processes mentioned above, that the modern story of steel begins. These, the blast furnace, and Thomas' discovery of a way to eliminate phosphorus, started steel on its amazing industrial march.



Model E Electric G&G Telescopic Hoist in use at N. Y. Telephone Co. Bldg., Brooklyn, N. Y.

85 Round Trips for One Cent Current Consumption

HERE is more evidence of the thrifty use of current by a G&G Electric Hoist. The Bell Telephone System uses 56 Hoists in its various buildings throughout the country.

At its main Brooklyn, N. Y., Building test was conducted by engineers of the Sprague Electric Works, with the following results. Can filled with ashes, weighing 150 lbs. was raised electrically and lowered by gravity 12 times. Distance of lift 16 ft. 8 in.

Can	Starting Amps.	Running Amps.	Finishing Amp.	Seconds
1	4.3	3.8	4.0	12
2	4.2	3.8	4.0	12
3	4.2	3.7	4.2	12
4	4.3	3.8	4.2	13
5	4.4	4.0	4.3	12
6	4.3	3.75	4.25	13
7	4.45	4.0	4.3	12
8	4.5	3.9	4.3	13
9	4.5	4.0	4.2	12
10	4.5	3.8	4.3	12
11	4.3	4.1	4.4	13
12	4.2	4.0	4.35	12

Average watt-secs. for average run 12,155
Number of cans raised in 1 kwh. 296
Cost of current $.0348 per kwh; Net result, 85 round trips for one cent current consumption.

If you will tell us the kind of loads you are handling, the distance of lift, and something about the working conditions, our Engineering Department will be glad to recommend the proper G&G Hoist to meet your requirements and will quote you the cost of same. It places you under no obligation to ask for this information.

GILLIS & GEOGHEGAN
556 West Broadway **New York City**

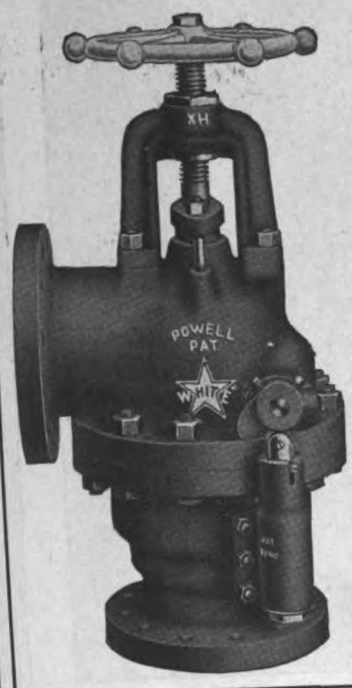
The G&G ELECTRIC REG. U.S. PAT. OFF Telescopic Hoist
With Automatic Stop and Gravity Lowering Device

Digitized by Google

"WHITE STAR"

TRIPLE-ACTING *NON-RETURN*

REGULATING BOILER CHECK VALVE



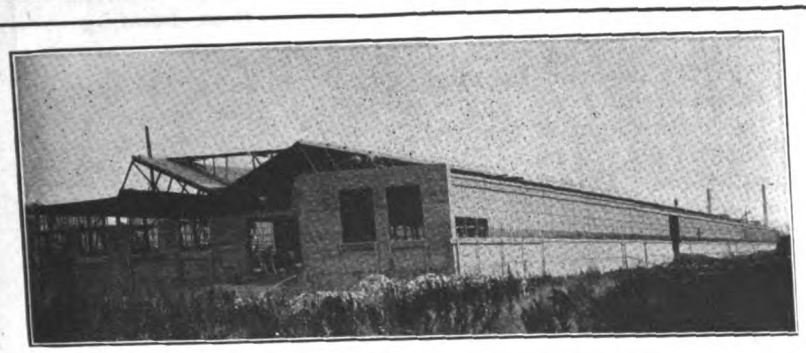
Isolates the Boiler in Case of Accident

The Powell Triple-Acting Boiler Check Valve safeguards lives and protects property. If a boiler tube blows the valve closes, and the boiler is thus isolated from the rest.

All Powell Valves are thoroughly tested and guaranteed. Write for circular.

The Wm. POWELL CO.
2525 SPRING GROVE AVENUE
CINCINNATI, OHIO

POWELL VALVES



Construction Costs
Have Reached the Bottom!

THE cost of building factory structures is at the lowest point since 1913. The increase in demand for additional manufacturing space which is already following the resumption of activities in many lines will soon produce an increase in building costs. Those who need factory space but have waited for the lowest point in building costs can profit by building during 1922.

An additional saving can be made by employing "MRBN" Engineers to plan the building for you. Write for one of the members of our firm to come and outline to you our method of handling the design of industrial buildings at minimum cost to you.

Thirty Years of MRBN Industrial Buildings

Build Now!

MILLS · RHINES · BELLMAN & NORDHOFF
Engineers
TOLEDO · OHIO

60

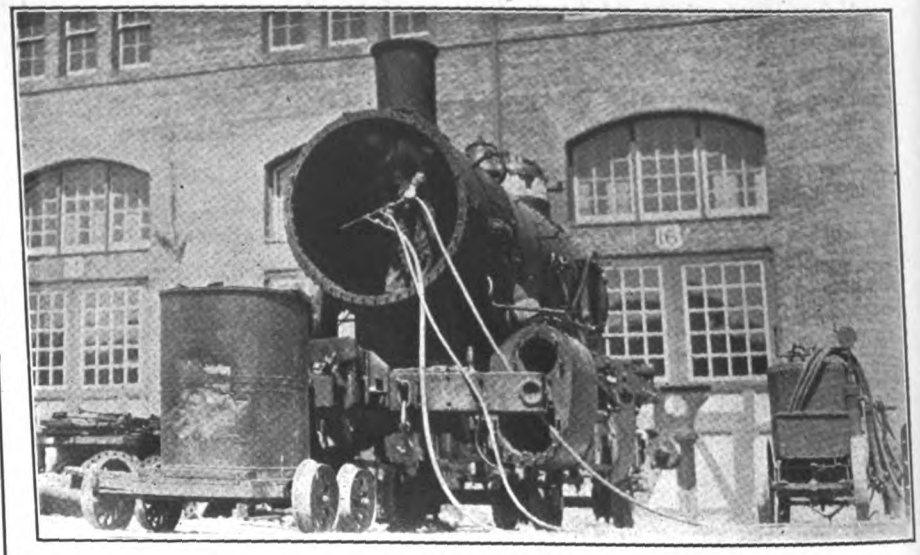
As these processes made steel both more plentiful and cheaper, its uses became more widespread; and intelligent study resulted in an infinite variety of steels for special purposes.

There is perhaps no substance in such universal use, for which it would be as difficult to find a substitute, as steel. It is hard to name any article of food, clothing, shelter—any luxury or necessity of modern life——which does not depend for its production on steel. No other metal can be made to do one-tenth of the things steel can and does do for us; not all the other metals together can perform its wide range of duties.

A century ago, this country made less than three percent of the world's steel, while today we make more than all the other countries combined; and the greater part of this increase took place in the last fifty years. In those same fifty years, the world's use of steel has increased from approximately seven hundred thousand tons (1870) to almost sixty million tons.

Little wonder that the Steel Dragon belches his hungercry of "Tonnage — More tonnage!"

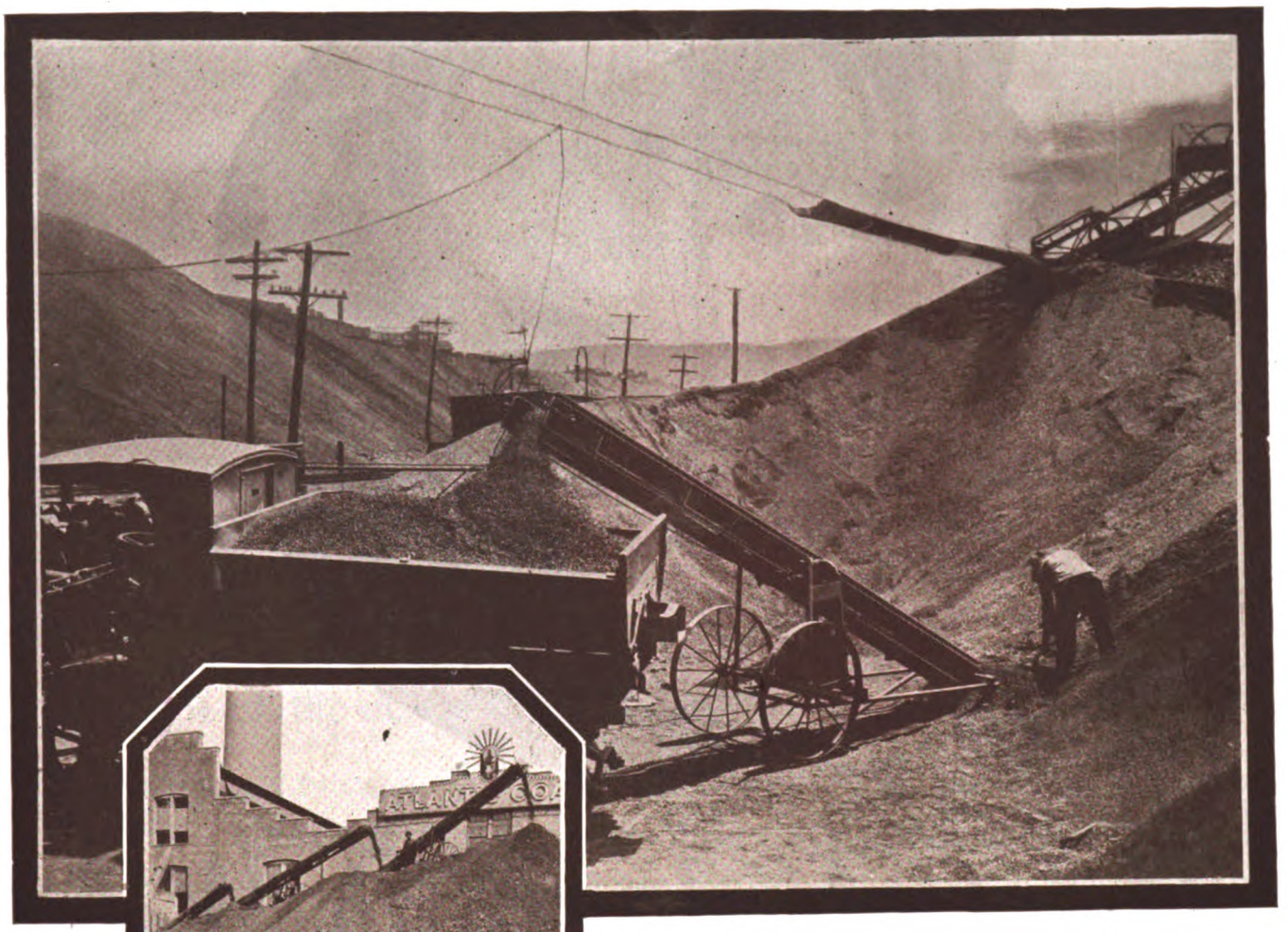
Using Sand, Compressed Air and Water to Clean Boilers



THE accompanying photo shows a device that has been perfected and placed in operation by the Southern Pacific Railroad in which water at 125 pounds' pressure is mixed with compressed air, and sand, and the mixture directed against boilers and boiler flues by a special gun, the purpose being to clean the scale from the flues and boiler. By means of this combination the scale is not only entirely and quickly removed, but as it is removed it is washed down with the water and sand, leaving the flues and boiler perfectly clean. There is no dust or sand floating around in the air, as is the case when sand is used with compressed air alone.



Digitized by Google



For Storing, Reclaiming, Loading, Unloading or Transferring coal and similar material.

Quality

WHEREVER Efficiency in handling is important you will almost always find the Scoop Conveyor.

Efficiency depends on reliability and reliability along with other portable conveyor requirements depends on quality. And quality is the first Scoop Conveyor virtue.

For the sake of such quality nothing is ever left undone. Quality comes first. It is built in at the factory. It comes forth in faithful performance.

Thousands of users who know the Scoop Conveyor best, appreciate most, what these statements mean.

Write for our Catalog No. 63.

Portable Machinery Co., Passaic, N. J.

ask any user

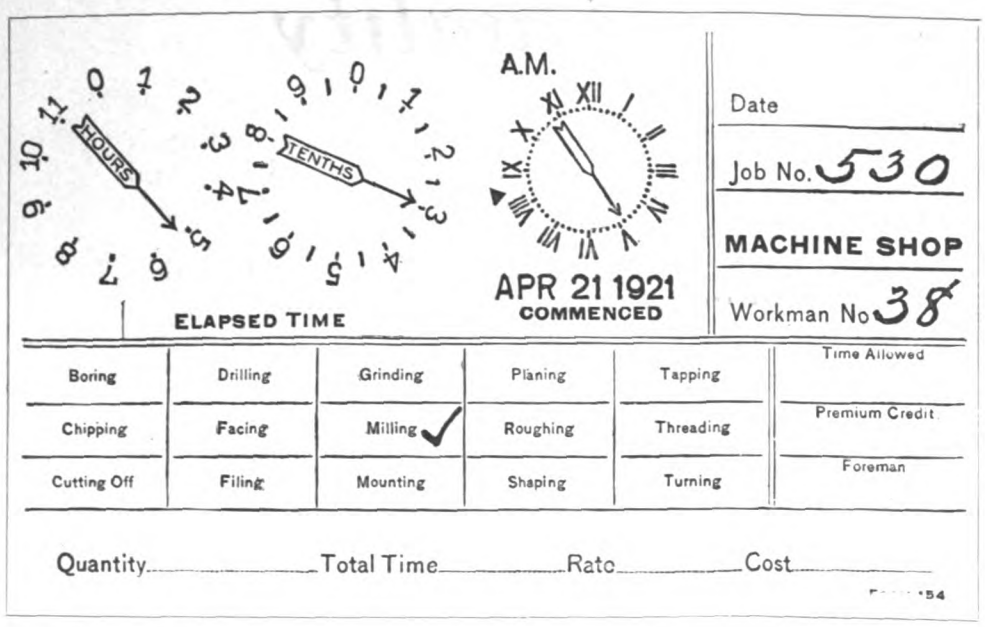
PORTABLE MACHINERY CO. PASSAIC N.J. U.S.A.

THE SCOOP CONVEYOR

Digitized by Google



The Calculagraph Way



One backward-forward movement of the right-hand Calculagraph lever when the job starts, a pull on the left-hand lever when the job is done, and the time record is complete.

The complete Calculagraph record reproduced opposite shows that a workman began milling job No. 530 at 8:24 A. M., April 21, 1921, and that the operation took five and three-tenths hours (hours and minutes printed if preferred). The elapsed time record is read directly from the card, without any figuring or possibility of error.

Any number of employees can use one Calculagraph without confusion of records.

THE CALCULAGRAPH

THE ELAPSED TIME RECORDER

34 Church Street **New York City**

Digitized by Google

Call Any Town 33 Miles or More from Your Office---

It's a safe bet that the time of your conversation will be recorded by a Calculagraph—

Why?

Because Calculagraphs are installed in 98% of all the long distance telephone exchanges throughout the world.

The reasons for this are the same as those which have caused it to be used in industrial plants the country over, the economical and dependable character of this **Time Recording Instrument.**

Economical, because it eliminates every chance of a personal equation entering into the time calculation, because it does not lose a single minute and because it needs no clerk to enter the figures on the workman's card or calculate the number of hours and minutes he has worked, for all these are automatically done by two pulls of the handle. Dependable because of its durable construction. There are no wiring or electrical troubles with a Calculagraph. Imprints are made on cards, obtainable from your own printer, by type that rotates continuously. The Calculagraph is operated by an 8 day, spring driven movement with jewelled balances and no matter how the hands of the clock may be manipulated, the elapsed time record cannot be falsified.

Send for your copy of
"Elapsed Time Records"

THE
CALCULAGRAPH
THE ELAPSED TIME RECORDER

34 Church Street **New York City**

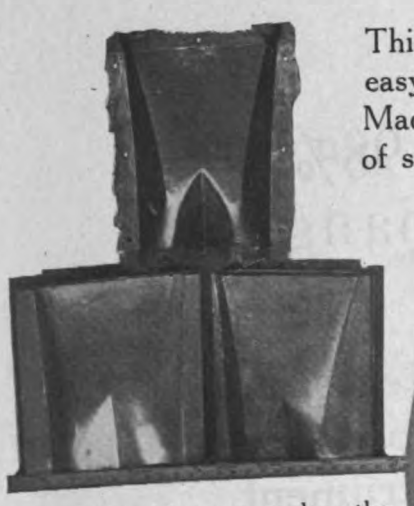
Digitized by Google

Do It Mechanically —by the Keller Method

The *sheet metal industries* too, have turned from obsolete hand die cutting to modern efficiency.

KME

Here are a few of the infinite variety of products from steel dies made on Keller Automatic Machines.



This pair of shovel dies was an easy task for a Keller Automatic Machine. By hand, the expense of steel dies was prohibitive.



Keller Machines reproduce the master accurately and rapidly,—hollowware, lighting fixture parts, builders hardware, are some of the lines benefitted by this method.



Small ornamental work or the largest automobile body and chassis dies are equally within the scope of the Keller Method.

For Fenders and Axle Housings—Dies and Punches are cut automatically and finished in less time than it used to take to rough out.

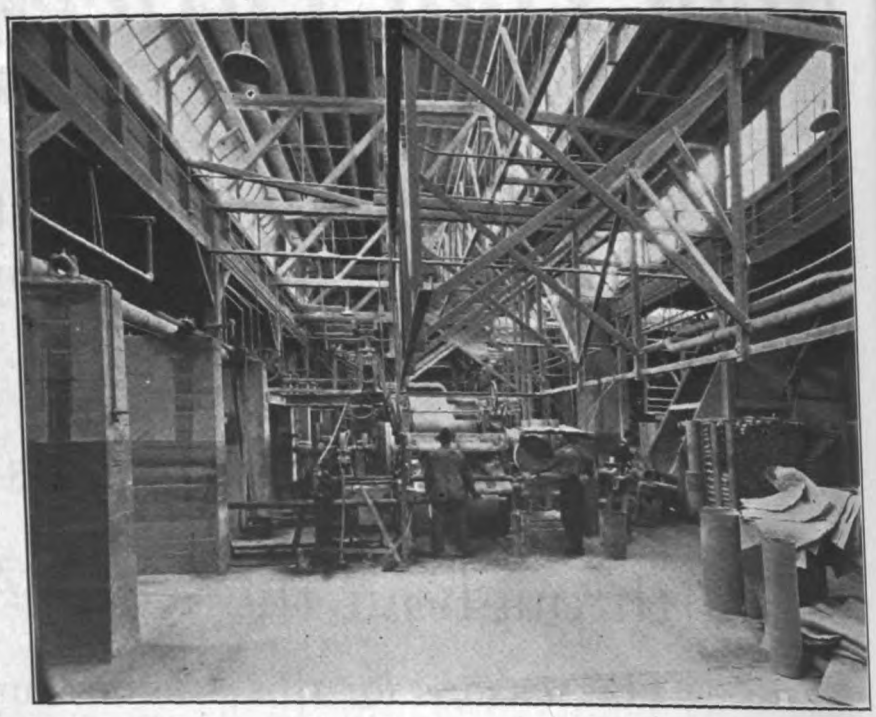
Keller Machines reproduce direct from plaster, wood or metal patterns—you can cut original or duplicate dies; also punches and forcers.

The Keller Method is applicable to every industry using Dies. Molds, Metal Core Boxes and Patterns.

ASK HOW IT APPLIES TO YOU

KELLER MECHANICAL ENGRAVING CO., 58 Washington [illegible]n, N. Y.

Adding Machine Renders Valuable Service in Manufacturing Roofing



ADDING machines are now rendering valuable service in the roofing plant of the Paraffine Companies Inc. located at Emeryville, Cal.

Large jumbo rolls of felt weighing from 1200 to 1500 lbs. are placed on a reel and run through the machine shown above coming out at the end of the machine as shown in the close-up view, below, and being wound up into rolls of equal length. Each roll of roofing is weighed as it comes from the machine and registered on the adding machine. When the jumbo roll has all been used up the adding machine shows the total number of rolls of roofing obtained from that jumbo, the weight of each roll of roofing, and the total weight of all rolls obtained from each individual jumbo roll.

The engineers of the company spent considerable time in figuring out just how these results could be achieved, when they finally decided that the adding machines would do the work.

Because of the dirt and dust each adding machine is thoroughly cleaned by compressed air each month.



Digitized by Google

The Evolution of Anti-Friction Bearings

(Continued from Page 10)

in point of workmanship was vastly superior to the chariots of Gaul and Belgium as well as Rome.

The pulley was also a mechanical contrivance of great antiquity. The first form of pulley was evidently a dead-eye designed to change the direction of a rope upon which a strain was placed. This in itself was an improvement over passing the rope around a pin, for the dead-eye was made of hard wood and had a smooth inner surface designed to reduce friction and wear on the rope.

The modern form of pulley, consisting of a sheave wheel turning on a pin held in a block, is said to have been invented by Archytas, a disciple of Pythagoras, about 516 B. C. The existence of pulleys on the great ship built by Archimedes is indicated in history. They were used for hoisting stones into the towers for supplying the catapult and other engines of war and for hoisting and lowering the sails. Compared to the dead-eye or the plain pin this pulley involved the use of anti-friction bearings. The friction of the rope on the inner surface of the dead-eye was replaced by the friction of the wheel on the pin which meant that the rope would not wear out so quickly and the load was easier to hoist.

So far, the bearing surfaces spoken of were probably made of wood, but with the advent of iron the excellent mechanical qualities of this metal soon caused it to be applied to bearing surfaces. It is supposed to have been discovered in Greece in the fourteenth century, B. C. but may have been already known in Egypt, China, and India for centuries previous to this. The Jews appear to have been acquainted with two kinds of iron previous to the Babylonish Captivity: the "barzel," which was in common use, and the northern iron as well as steel. Chariots, axes, arrows, weapons of iron were mentioned in Hebrew history between 1490 B. C. and 1040 B. C.

Jeremiah and Ezekiel speak of iron and mention two varieties, one of which was called "bright iron" this was probably steel. We learn from the Iliad that at the time of the siege of Troy (1184 B. C.) iron was used in various ways including axles for chariots. Undoubtedly the main advantages of iron as a bearing metal were soon recognized by the various nations, as iron from that time on became an important adjunct in the development of the mechanic arts.

It is rather a far jump from the periods just mentioned to the seventeenth century, but the history of every nation shows that the science of mechanics lay dormant until the age of invention re-established the principles that had been evolved by the ancients and carried them to their present day perfection.

For thousands of years wheeled conveyances seem to have remained unimproved. The mechanical contrivances of the barbarous nations which had their rise between Egyptian civilization and our own were of the crudest form and far inferior to those developed



Announcing the new
"Y and E" Commercial Steel File
—point by point—the best file "buy" ever offered

GENUINE "Y and E" quality and workmanship, electrically welded steel construction, real roller slides, standard "Y and E" drawer suspension—and all at *a price below anything* of its quality on the market. Without exception, the best file "buy" you've ever seen.

Note these outstanding advantages

1. Real roller slides and the same drawer suspension usually found only in high-priced files.
2. Ten inches more filing space than the average, making it the lowest cost per inch of usable space of any high-grade file.
3. Strongly re-enforced to make the file rigid and durable under the heaviest loads.
4. Beautiful olive-green finish with enamel baked right into the steel itself.
5. Standard "Y and E" construction, intermembering with the "Y and E" 5300 line of files.

See this file on display in all "Y and E" branch and agency stores. Or mail the coupon today for prices and details.

YAWMAN AND ERBE MFG. CO.
Filing System Service, Equipment and Supplies
943 St. Paul Street ROCHESTER, N.Y.
Branches, Agents or Dealers in all principal cities
In Canada: The Office Specialty Mfg. Co., Ltd., Newmarket, Ont.

"Y and E"
Yawman & Erbe Mfg. Co.
Rochester, N.Y.

Please send information and prices on your new "Y and E" Commercial Steel File.

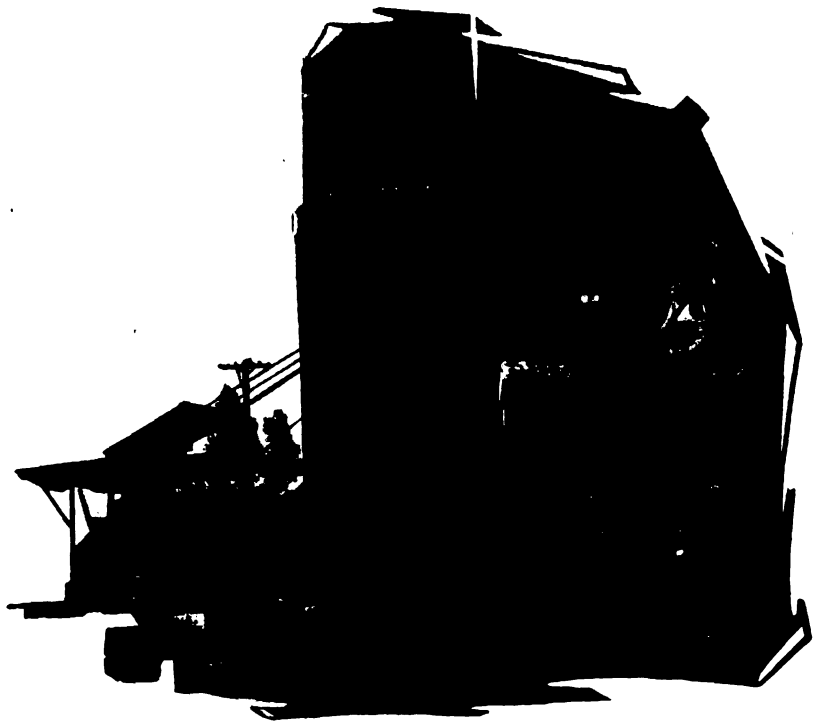
Name.....

Address.....

Digitized by Google

The "P & H" Handles

Anything — Anywhere



P&H CORDUROY CRANES

For the past 40 years Industry has been coming to P & H for Cranes. Industrial Engineers everywhere have been consulting us about their needs realizing that as builders of over 7000 Cranes of every nature P & H are competent to advise.

Recognizing an urgent need—some years ago—for a gasoline or electric-driven portable crane, P & H developed a line which requires no runway or tracks and which is unrestricted as to operating area.

These cranes, hundreds which have gone into use during the past eight years on all classes of work, are made up to the same standards of design and construction as P & H Overhead Cranes. The same craftsmanship is apparent in every part.

The P & H Corduroy Cranes run on their own corduroy traction—are operated by gas or electricity, require only one operator, need no tracks, and can maneuver about to any side of a railroad car or stock pile where needed. They are ready for service at the turn of a crank and can be stopped immediately. There is no objectionable smoke so that the machine can be operated indoors as well as outdoors.

Pawling & Harnischfeger are the only manufacturers of both overhead traveling and portable cranes in the United States. The recommendations of our Sales Engineers are therefore unbiased and you can place your problems before them with full confidence that their recommendations are not prejudiced.

In the industrial field the P & H portable crane is used with crane hook, magnet, clam shell or dragline bucket or with a shovel boom by such representative firms as Standard Oil, Mohawk Valley Mills, American Steel & Wire Co., North and Judd Mfg. Co., Western Pipe & Steel Co., and others.

PAWLING & HARNISCHFEGER CO.

Established in 1884

3850 National Avenue, Milwaukee, Wis.

New York, Pittsburgh, Salt Lake City, Los Angeles, Portland, Chicago, Philadelphia, San Francisco, Denver, Seattle, St. Louis, Birmingham, New Orleans, Phoenix, Atlan...

by the Greeks and Egyptians.

As the age of invention began to dawn, iron soon took its place of importance as the best metal in the manufacture of the rude looms and other textile machinery which really marked the beginning of the new era. The earliest experimenters found that cross-grained iron makes an excellent bearing metal. Being of a granular nature it has the property of retaining the lubricant in place even when highly polished and under pressure. It was, therefore, the logical metal for the bearings on the first machines and we find it was used universally.

Iron reigned supreme as a bearing metal until the nineteenth century, when an Englishman named Babbitt patented in 1839 his mixture consisting of a compound of tin, antimony and copper, set forth in his patent specification, as an "anti-friction compound especially adapted for the lubricated bearings of machinery." Here we have the first modern anti-friction bearing. Its advantage over cast iron is that, being a soft metal, it can be cast directly upon the shaft for which it is to form a bearing surface and adapts itself to irregularities of the shaft, forming a surface far superior to any which can be machined in iron. This theoretically, is an advantage but in practice we find that every babbitt bearing must be bored out to a diameter slightly larger than the diameter of the shaft to allow a place for lubricant. Unlike iron, moreover, babbitt metal is very brittle and will not stand shocks and strains, and therefore has to be backed up with iron or steel properly to perform its function.

Another advantage of babbitt metal was evident when it was found that the nature of the surface of this metal attracted particles of oil, allowing it to spread over the entire surface of the metal as a thin film. This film of oil is the most important point in the lubrication of those bearings where rubbing friction occurs.

Lubrication, as it is considered in mechanics, is the introduction of a smooth fluid substance, preferably an oil, between two hard moving surfaces to keep them from coming in direct contact. Unless the surfaces are kept apart by some medium, the asperities and irregularities which exist on all surfaces, no matter how smooth or hard, will interlock; and the friction caused in tearing them apart and wearing them down will generate heat. Oil performs its function as a lubricant by flowing between the close fitting surfaces, filling the interstices and forming a cushion. It also aids in dissipating any heat generated. We find, therefore, that Babbitt was entirely correct in naming his new discovery an anti-friction compound, because the friction between babbitt metal and iron is much less than that between iron and iron because the babbitt metal offers a surface upon which a film of oil can easily form.

During the nineteenth century, of course, new forms of bearings were being developed, but no important improvement on the babbitt bearing was brought forth until in 1871, when the properties of phosphorus bronze indicated that it possessed many advantages over babbitt metal. Bronze is rendered so liquid by the addition of phosphorus in the molten state that it forms very clean castings, filling the mold perfectly to the smallest detail. It has the added advantage of being much harder than babbitt metal and, therefore, shows wear very much more slowly.

From this time on evidences began to appear here and there of the use of ball and roller bearings of a rude nature. Probably all of us remember the old grindstone on grandfather's farm where each end of the axle rested on the peripheries of two small wheels set opposite each other which themselves turned on axles with plain bearings. Here the axle of the stone, in turning, caused the two wheels to turn, and the only friction existing between the surface of the axle and the peripheries of the wheels was rolling friction. Of course, there was rubbing friction on the axles of the small wheels. This was clearly an anti-friction bearing whose function was to distribute the greater load of the stone and the greater speed of its axle to the four axles of the wheels which turned at a slower rate of speed than the grindstone, in the ratio of the perimeter of the axle to the perimeters of the wheels.

The 1884 edition of Knight's American Mechanical Diction-

Digitized by Google

ary mentions anti-friction bearings (roller), anti-friction boxes (ball) anti-friction metal and anti-friction pulleys (roller) and it is evident that the basic principles of these bearings had been long understood; but since there was no demand for bearings of this type at that time they had not been developed much further than the experimental stage.

This was the condition of affairs when in 1884 an inventor began experimenting with sugar cane mills and perfected one far superior to any then used, both in the efficient manner in which it increased the percentage of pure extraction from the cane and in greatly diminishing the time necessary for the operation.

The principles of this machine being worked out, he was confronted with the impossibility of obtaining bearings in the market capable of satisfactorily standing the heavy duty required of the bearings in his cane mill. This directed his attention to the use of anti-friction bearings; that is to say, he wanted a bearing which would properly operate in his mill with less friction than any of the bearings then on the market, and he therefore directed his inventive genius to the development of a bearing to meet his requirements.

He tried different types of balls, including porcelain, agate and steel; and rollers, including wood rollers, solid steel rollers, short lengths of pipe and tubing with all kinds of retaining cages and housings. Each was partially successful but applied to the machine soon proved unsatisfactory and necessitated a fresh start.

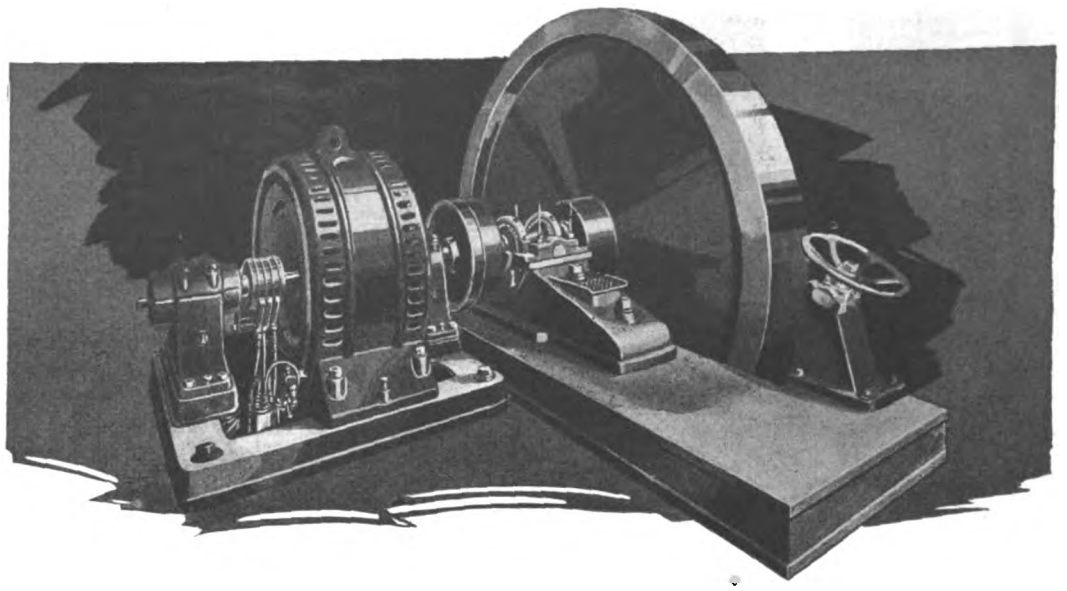
After years of patient research and exhaustive experimentation he finally evolved a satisfactory roller bearing using hollow flexible rollers, and in 1892 a company was formed for the manufacture of this bearing.

Small ball bearings of the cup and cone type were coming into extensive use on bicycles at this time and a real future for ball and roller bearings was assured. The birth of the automobile at about this period, a mechanism which required bearings of a superlative type, seems a coincidence. Ball and roller bearings were logically used on the first automobiles ever brought out and have ever since held a most important place in automobile design. Their unvaryingly successful use in modern machines of all types, on thousands of line shaft and in mine and industrial cars throughout the world proved them to be of truly economical importance.

Since their inception these anti-friction bearings have been constantly improved in design and material, until today they are as superior to the bronze bearing as was the bronze bearing to the wooden bearing of the first Egyptian chariot.

Anti-friction bearings, in replacing babbitt and bronze bearings, returned iron (in the form of steel) to the important place as a bearing metal which it merited by reason of its many excellent mechanical qualities. The reduction in friction obtained by the substitution of rolling friction for rubbing friction, the concentration of loads upon hardened surfaces allowing narrower bearings

SKF



Five Hours on its Own Momentum
—An Achievement Possible Only With Ball Bearings

FIVE hours of motion without power! Unbelievable—but nevertheless an actual fact, as demonstrated by this fly-wheel type alternator which revolved on its own momentum for five hours.

Four SKF marked self-aligning ball bearings are used to support the revolving parts running at 500 R.P.M. and weighing 44,000 pounds.

You can imagine then the amount of energy which the use of ball bearings, as compared with plain bearings, saves in the course of a year in any plant. Since the saving in each machine is added to that of the others, the total is no mean quantity and represents a substantial increase in plant efficiency and a worth-while economy.

When self-aligning ball bearings are used friction is practically eliminated and marked economies effected as well in lubrication and maintenance. See that your electrical machinery is ball bearing equipped.

THE SKAYEF BALL BEARING COMPANY

Supervised by SKF INDUSTRIES, INC., 165 Broadway, New York City

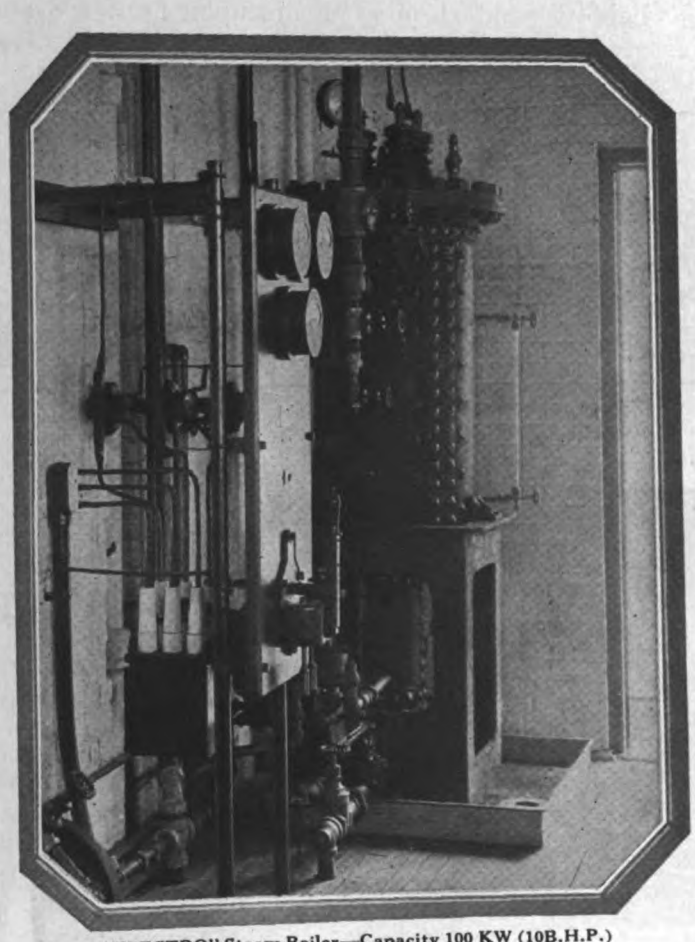
765



BALL BEARINGS
The Highest Expression of the Bearing Principle

Digitized by Google

Steam *from* Surplus Electric Current



"ELECTRO" Steam Boiler—Capacity 100 KW (10B.H.P.) 2200 volts, 3 phase, 25 cycles, 80 lbs. gauge, installed for Frank & Lochner, Inc., by Volker Bros., Engineers, Buffalo, N. Y.

Many industries find that a portion of their electric power, particularly where it is contracted for by the year, is idle a part of the day.

The "ELECTRO" Steam Boiler is a solution to the problem of turning this waste energy into useful work. It generates steam by the passage of high voltage alternating current between electrodes immersed in water.

No coal or any other fuel is required. And the amount of steam generated, the pressure and the amount of power used is governed and under control—the regulation is obtained by the height of the water or the depth of the immersion of the electrode.

The "ELECTRO" Steam Boiler has the following advantages over fuel-fired Boilers.

Low initial cost.
Space occupied for steam generated reduced to the minimum.
Thermal Efficiency 98%.
No expensive boiler and smoke-stack foundations.
No water softening required.
Fuel and ash handling equipment, oil storage, tanks, coal bins and railroad sidings absolutely elimated.
Lowest insurance rates.

The "Electro" Steam Boiler is adaptable to the following Industries:

Paper and Pulp
Lumber
Chemical
Electro-chemical
Textile
Hydro-electric Power Plants
Gas Plants
Silk Mills
Fruit Canning
Cement Mills
Central Heating Plants

The "ELECTRO" is built in several types and sizes in accordance with requirements. A number of large installations are in successful operation, including one of 20,000 kilowatts, capable of raising 60,000 lbs. of steam per hour at 130 lbs. pressure.

Send for further particulars.

ELECTRIC FURNACE CONSTRUCTION COMPANY
908 Chestnut St.
Philadelphia, Penna.

and therefore more compact designs, and the ease with which they could be entirely enclosed in housings, thus making for efficient lubrication, were advantages soon apparent to the engineering world.

All the bearings brought forth previous to the babbitt bearing, were improvements in both design and material. The effect of the invention of babbitt metal upon the general improvement of bearings can be shown graphically, with time and bearing improvements as ordinates.

A line drawn, from a point representing the stone dragged on the ground in the forty-ninth century B. C., to a point representing anti-friction bearings in the twentieth century A. D., will show the logical development of bearings throughout the ages. All of the bearings where improvements of design and material were simultaneous can be represented by points on this line.

The babbitt bearing was certainly an improvement in design, in that it eliminated friction; but this improvement was only attained by the substitution of a metal of poor mechanical qualities for iron, whose mechanical qualities are unexcelled. The babbitt bearing therefore denotes a break in the line of logical bearing development.

If the modern forms of ball and roller bearings had been invented in the early part of the nineteenth century, babbitt and bronze bearings would probably never have been used, because ball and roller bearings were a mighty step forward *both* in bearing design and in bearing material, and offered a practical release from the many disadvantages of the old types of bearings.

Why does the enormous annual waste of power, lubrication, and the money spent in replacing old fashioned bearings, still continue—in spite of the many advantages of anti-friction bearings? Because so many of the men upon whom rests the responsibility for bearing changes are afflicted with mental inertia, that intangible force which resists all change. Men who have achieved great things in machine design, in spite of the handicap imposed by soft metal bearings, are often blind to the much greater achievements made possible by the many advantages of anti-friction bearings.

The first wheel in Egypt was looked upon as an interesting improvement upon the sledge, admirable for the chariots of kings, but not of real importance to the majority of the men who had loads to convey. Are anti-friction bearings excellent for automobiles and not for other modern mechanisms?

In the face of the evidence presented by history there is no excuse for the use today of plain, babbitt or bronze bearings in any machine. It is an engineering and economic crime to construct machines of high grade steel, machined to close limits, and then use soft metal bearings which sacrifice all the excellent mechanical qualities of steel in order to secure a surface upon which a film of oil will readily form.

The ultimate universal use of ball and roller bearings in machinery of all kinds is the logical outcome of centuries of development and it is but a matter of time until all of the antiquated, wasteful, troublesome bearings of the early days of the age of invention will be replaced by modern anti-friction bearings and the very word bearing will convey to every engineer's mind these bearings in their most improved form.

Thinking

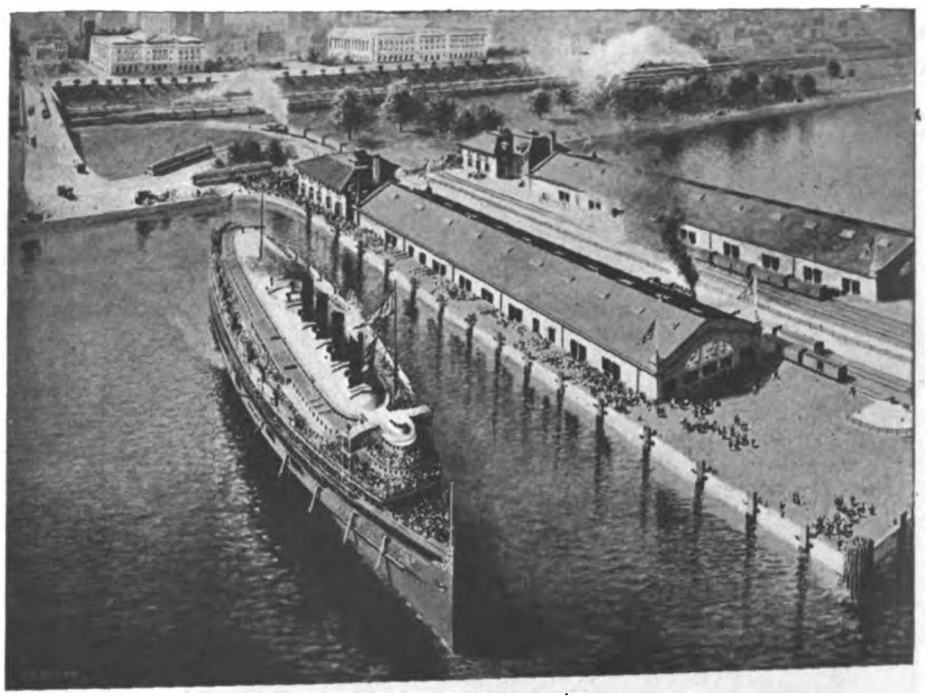
If you think you are beaten, you are;
If you think you dare not, you don't;
If you'd like to win, but you think you can't
It's almost a cinch you won't.
If you think you'll lose, you're lost,
For out of the world we find
Success begins with the fellow's will—
It's all in the state of mind.

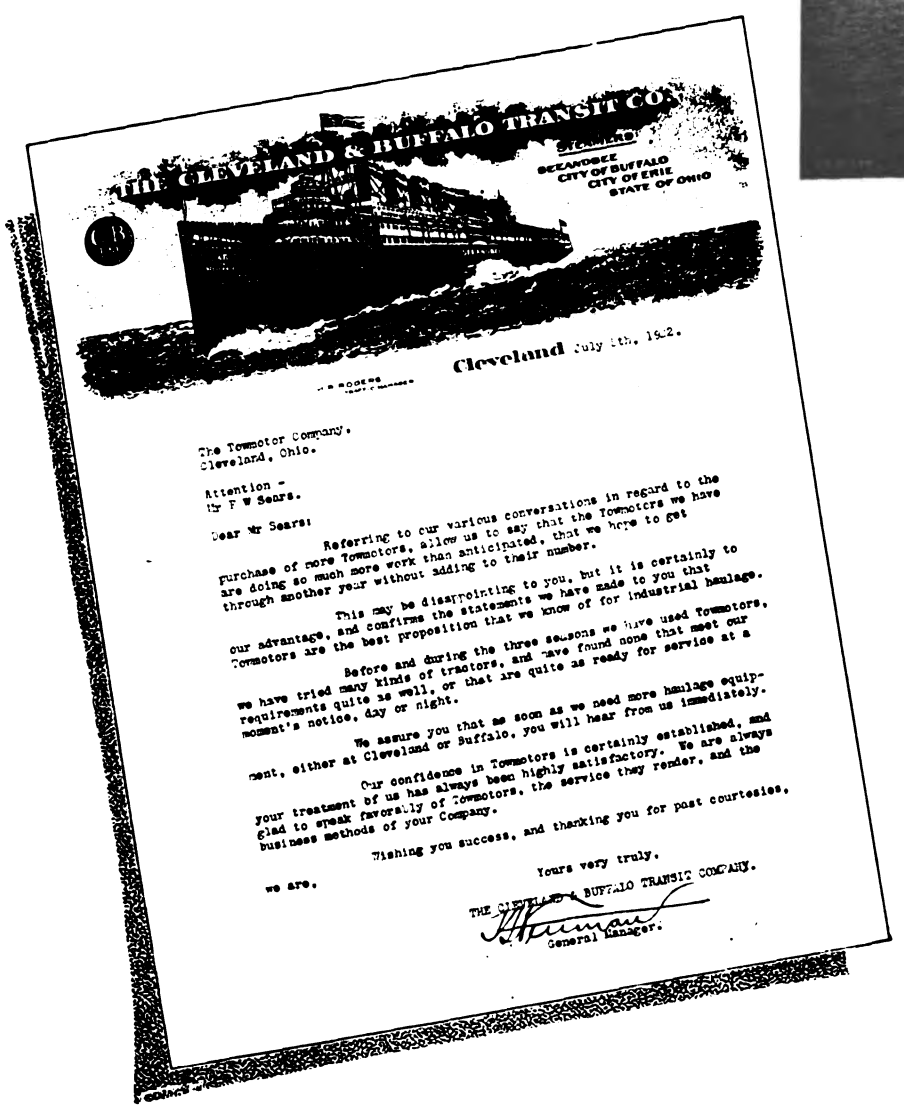
If you think you are outclassed, you are;
You've got to think high to rise,
You've got to be sure of yourself before
You can ever win a prize.
Life's battles don't always go
To the stronger or faster man,
But sooner or later the man who wins,
Is the one who *thinks* he can.

—Robert Burns.

Digitized by Google

The great ship "SEEANDBEE" flagship of The Cleveland & Buffalo Transit Co. is **the largest and most costly** steamer on the inland waters of the world—is loaded and unloaded daily with the aid of TOWMOTORS.




THE CLEVELAND & BUFFALO TRANSIT CO.
STEAMERS
SEEANDBEE
CITY OF BUFFALO
CITY OF ERIE
STATE OF OHIO

Cleveland July 15th, 1922.

The Towmotor Company,
Cleveland, Ohio.

Attention -
Mr F W Sears.

Dear Mr Sears:

Referring to our various conversations in regard to the purchase of more Towmotors, allow us to say that the Towmotors we have are doing so much more work than anticipated, that we hope to get through another year without adding to their number.

This may be disappointing to you, but it is certainly to our advantage, and confirms the statements we have made to you that Towmotors are the best proposition that we know of for industrial haulage.

Before and during the three seasons we have used Towmotors, we have tried many kinds of tractors, and have found none that meet our requirements quite as well, or that are quite as ready for service at a moment's notice, day or night.

We assure you that as soon as we need more haulage equipment, either at Cleveland or Buffalo, you will hear from us immediately.

Our confidence in Towmotors is certainly established, and your treatment of us has always been highly satisfactory. We are always glad to speak favorably of Towmotors, the service they render, and the business methods of your Company.

Wishing you success, and thanking you for past courtesies,

we are,

Yours very truly,

THE CLEVELAND & BUFFALO TRANSIT COMPANY.

General Manager.

TOWMOTORS

are in constant use

At both terminals of The Cleveland & Buffalo Transit Co., whose fine ships and splendid service are the admiration of every patron of this popular line.

The "SEEANDBEE" which carries hundreds of tons of freight and fuel in addition to its passenger list, makes the trip from Cleveland to Buffalo over night, is unloaded there in the morning, loaded again in the afternoon and returns to Cleveland that night. The "City of Buffalo" alternates with the "SEEANDBEE," completing the service.

These boats must run true to schedule. Freight and fuel must be handled efficiently and expeditiously. For this work TOWMOTORS are used, and in the past three years of uninterrupted service, they have made themselves indispensable to The Cleveland & Buffalo Transit Co.

The accompanying letter expresses their opinion, and is a convincing argument for the use of TOWMOTORS wherever uninterrupted service—twenty-four hours a day if necessary—is essential.

THE TOWMOTOR COMPANY

1226 East 152nd Street **Cleveland, Ohio**



THE TOWMOTOR

Digitized by Google

NOW is the Time to PLAN for An Ever-Available Coal Supply!



BUILT STRONGER LASTS LONGER

Delay—and thousands of dollars may be the penalty. Strikes on the railroads and at the mines do not await your preparedness. A depleted coal supply would cost you a mighty big sum in lost orders and expense incident to interrupted factory production.

Plan *now* for an ever-available supply. A G-W Ground Storage Plant, similar to the one above, would provide it—would assure an auxiliary coal supply to tide you over a coal shortage. Quick installation, low initial cost, and minimum maintenance are the advantages of its unusually simple construction. It utilizes waste ground area and in most all instances can be erected without changes to, or interfering with, existing equipment.

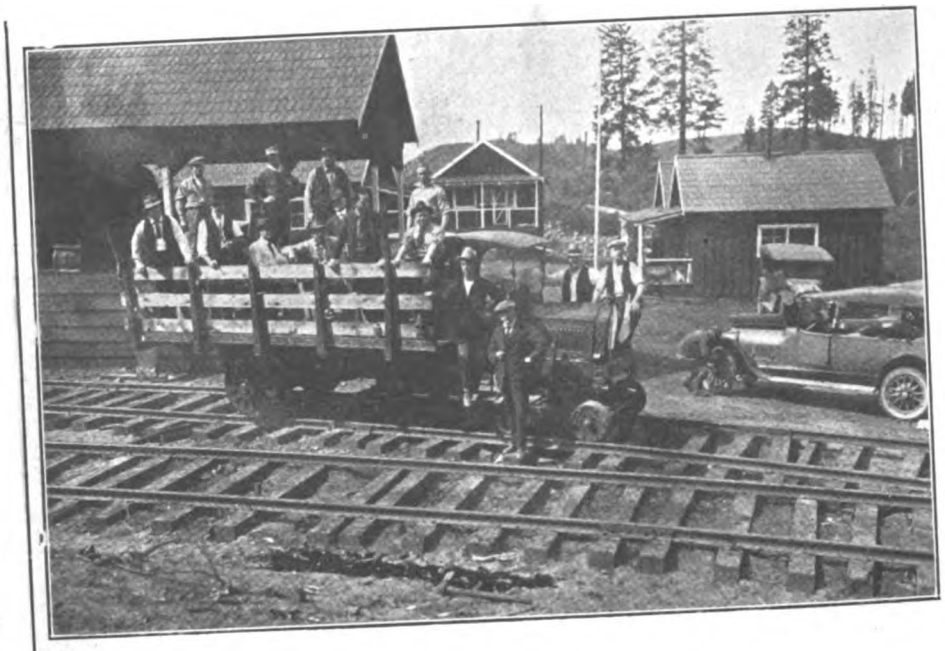
Now is the time to plan. Gifford-Wood Engineers and our many years of experience are at your disposal. G-W Coal Handling Equipment includes every type—complete plants down to wagon loaders and portable belt conveyors. We'll gladly have a G-W representative call on you or, if you prefer, send a catalog first.

MAIN OFFICE & WORKS: HUDSON, N. Y.
New York Chicago Boston Buffalo

2094-R

Gifford-Wood Co.

COAL HANDLING EQUIPMENT



Automobile Trucks on the Hetch Hetchy Railroad

A FLEET of automobile trucks are now rendering valuable service on the Hetch Hetchy Railroad, which is operated by the city of San Francisco in the construction of the Hetch Hetchy Power and Water project.

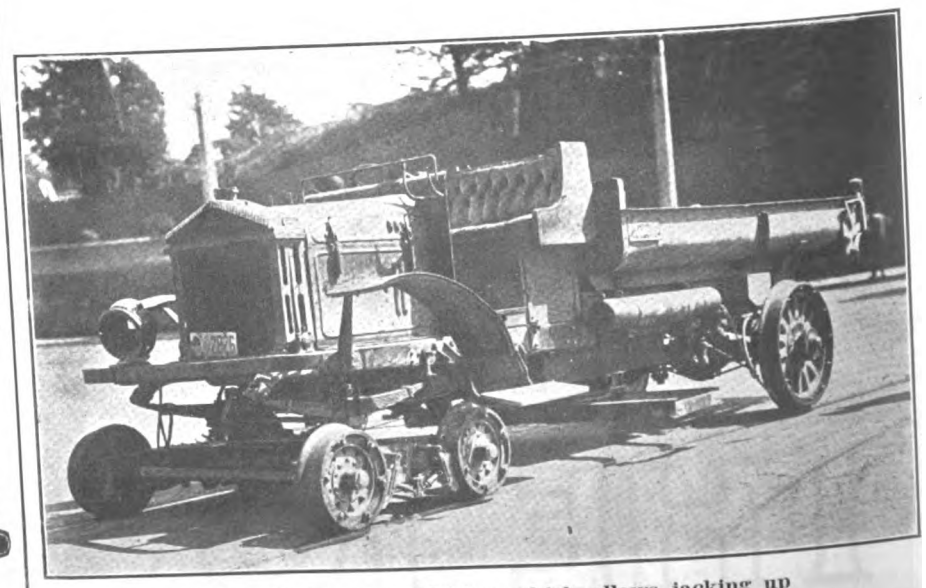
The trucks are equipped with flanged wheels in the rear and pony trucks in front. The front of the chassis is mounted on a ball bearing center plate and roller side bearings, which eliminate friction.

The cars carry their own turntable, which consists of a structural steel frame bolted together and fastened in the center of the car. By jacking up under the frame, sufficiently to raise the wheels above the track, the car can be turned end for end. This frame is plainly seen beneath the truck in the illustration below.

Sand, for tractive purposes, is forced on the rail in front of the rear wheels by means of compressed air. The sand is carried in a box in front of the rear wheels. In front of this sand box is a cylinder, in which air is compressed by an air compressor operated from the main motor.

The brakes on the pony trucks operate in a manner similar to the brakes used on the ordinary power hand car. These brakes operate in conjunction with the rear brakes.

Some of the trucks are interchangeable, and can be equipped with a dump body as shown below, or with the body shown at the top of this page, this latter car being engaged in regular express service along the line.



Note the frame amidships, which allows jacking up the truck so that it can be turned end for end.

Digitized by Google

"WBAY"

The New American Telephone and Telegraph Company Toll Broadcasting Station

ON Thursday evening, August 3, in a little room on the top floor of 24 Walker Street, New York, eight men stood in breathless silence, listening to the bed-time discourse of "Uncle Wiggly" that issued from the loud speaker hung from the ceiling. All of the men were watching the big clock on the wall. Seven-twenty-nine, it registered, Daylight Saving Time.

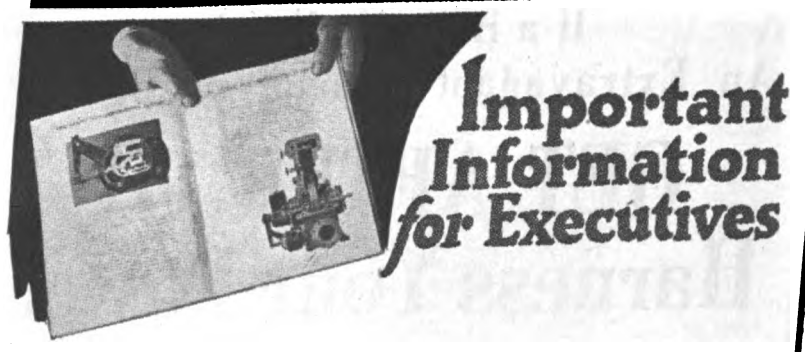
And then, as Uncle Wiggly's station signed off and thousands of listening youngsters theoretically lapsed into wrapt slumber, a man standing in front of a switchboard pushed a button. In the studio room, two doors down the hall, a buzzer spoke, and C. W. Peck began his talk that marked the official opening of "WBAY," the toll broadcasting station of the American Telephone and Telegraph Company, in New York.

In the entertainment that followed, musical selections were rendered by Miss Graves, Mrs. Swayze, Miss Mills, Miss Hermann, Mr. Joseph Koznick, Mr. Harry Armstrong and Mr. F. R. Marion. Frank Graham who keeps baseball fans supplied with the latest diamond chatter with his stories in the New York Sun, talked to the radio fans about the pennant chances of the New York teams and threw in some personal sidelights on many headliners.

Just outside the radio operating room stood a long table, on which rested half a dozen telephone instruments. Two minutes after "WBAY" began operating, these phones began ringing. Amateurs everywhere had been invited to



Here is Robert Fennimore, A. T. & T. engineer who has worked tirelessly for weeks to get "WBAY" into the pink of operating condition, checking up on his handiwork. By watching the ammeter at the upper right of the panel just in front of Mr. Fennimore, it is possible to trace the modulation of the voice of a speaker when the station is sending.



A NEW general bulletin has just been issued on steam turbines. It is a simplified, condensed text book on the design and application of non-condensing, condensing, bleeder and mixed pressure turbines, and of reduction gears. It is free from highly technical explanations and in fact, the British Thermal Unit (B. T. U.) is not mentioned once therein. The steam turbine occupies a definite position in the engineering world of today and its use is not a question of personal fad or fancy but of economic necessity.

There are many special applications throughout the industrial field for turbines in the smaller non-condensing sizes which make big money savers. The money savings which can be effected depend more upon the conditions under which the non-condensing turbine operates than on the actual efficiency of the turbine itself. The facts contained in this bulletin will materially help you in determining what conditions favor the application of the various types and with its many illustrations will clearly explain to you the mechanical construction and uses of each. Write now for your copy of Bulletin Z-25.

T-785

THE TERRY TURBINE

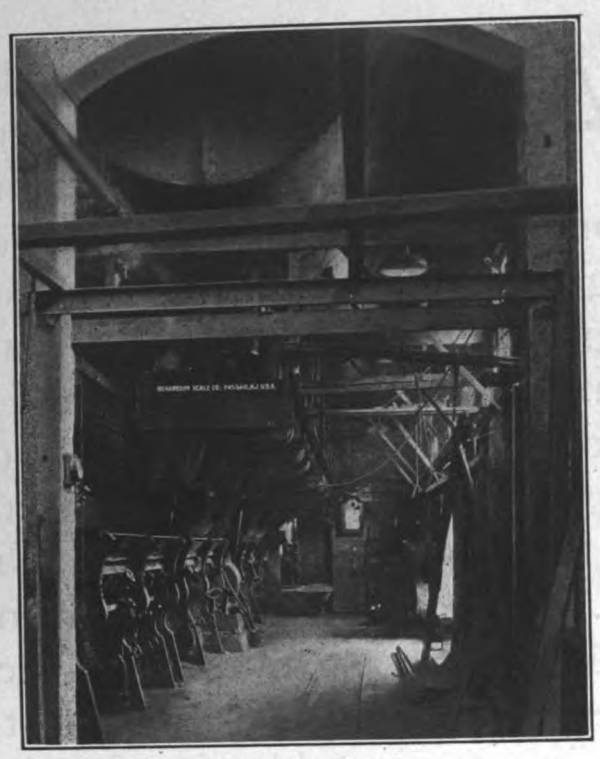
Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co.
Terry Sq. Hartford, Conn. U.S.A.

Digitized by Google

If a Boiler Is Using
An Extravagant Amount of Coal—

GET AFTER IT!
Harness Your Power



USE THE RICHARDSON
AUTOMATIC COAL SCALE

To check the consumption of each individual boiler in your plant

YOU'LL GET BETTER EFFICIENCY AND
SAVE MONEY ON YOUR COAL BILLS

Accurate continuous records of consumption automatically registered by the machine. Scale weighs any kind of coal successfully. Wet or frozen lumps won't faze it. Absolutely sulphur proof and rust proof.

Faulty Draft regulation, improper firing, soot, scale, holes in the fire, all tend to lower the efficiency of a boiler. A RICHARDSON will locate the trouble and you can correct it.

Supplied in the following standard sizes:

200 lb. size, 1	ton hopper, capacity 6	tons per hour
300 lb. size, 1½	ton hopper, capacity 9	tons per hour
400 lb. size, 2	ton hopper, capacity 12	tons per hour
500 lb. size, 3	ton hopper, capacity 20	tons per hour
1000 lb. size, 5	ton hopper, capacity 40	tons per hour

RICHARDSON SCALE COMPANY
Passaic, New Jersey

New York Boston Buffalo Chicago Minneapolis
Omaha Wichita San Fr[illegible] Memphis Atlanta

call the station and say how they were getting the newcomer in the field of aerial entertainment.

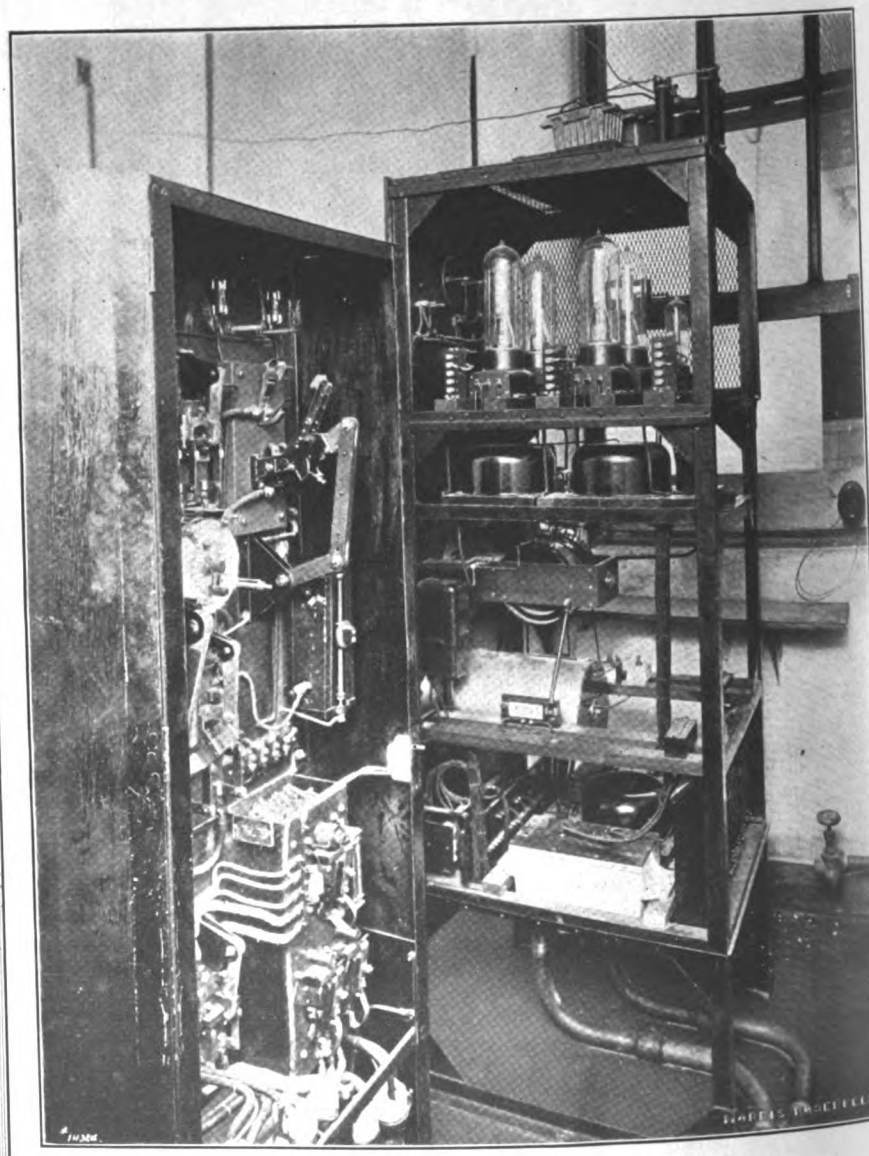
From Coney Island, Princeton, Montclair, Yonkers, Union Hill, River Edge, Larchmont, Patterson, and dozens of other towns the calls came in. Men with crystal sets expressed their pleasure of getting piano music clearly. An operator in South Jersey with a two-bulb set complained of a crackling noise, but thought a local thunder shower might have had something to do with it. And from thirty miles out on Long Island came the report of a fan with a loop set mounted in his car. He was traveling around, he said, and picking up "WBAY" every time he stopped.

One of the Company's telephone men in Princeton, N. J., called up and said if the boys wanted to see how he was getting them over his own set they could listen on his wire. They did listen, and heard in the receiver the voice of the soloist two doors down the hall in the studio room—a voice carried through the transmitting apparatus to the ether, converted at Princeton from electric waves to sound, and then relayed back as infinitesimal currents over the telephone.

Back in the days when radio was beginning to grip the heart of the public with its fascination and its mystery and its novelty, requests began to come in to the American Telephone and Telegraph Company for apparatus suitable for broadcasting. Theatres wanted to broadcast. All sorts of individuals and groups and organizations with a message to deliver to the public wrote in to ask for prices on equipment that would enable them to put their stories into the air.

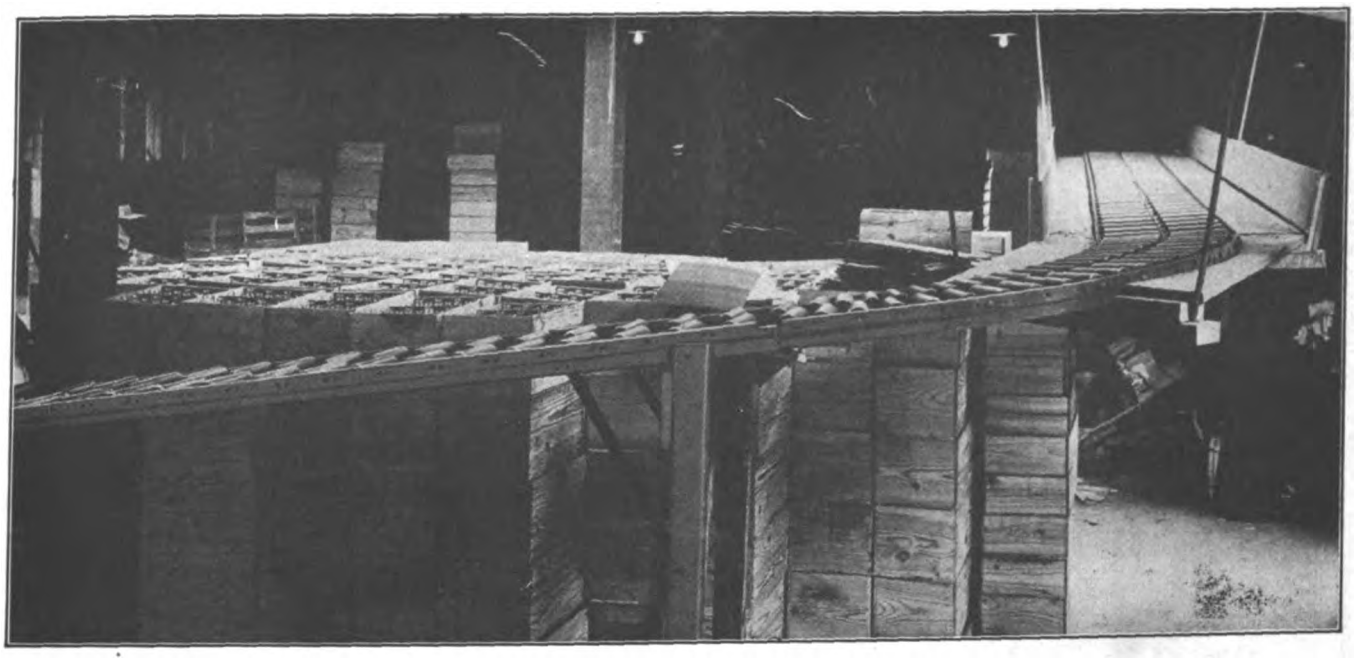
There were two main factors in the situation which these potential broadcasters did not realize at the time: First, that there is such a thing as interference when dozens of differing a thoroughly up-to-date station is too high to justify

(Continued on Page 46)



Rear view of the transmitting apparatus showing the power panel and the four 250-watt vacuum tubes, two of which act as oscillators and two as modulators. The 50-watt tube for preliminary amplification of the speech is also shown.

Digitized by Google



More Speed—Less Cost in Conveying

From one end of your building to another, through crowded stock rooms, to or from the shipping rooms, cases of bottles and cans are carried quickly and smoothly by the force of gravity. Labor expense is cut, breakage loss reduced, unnecessary and costly delays are eliminated. The

MATHEWS
SPEED ECONOMY
GRAVITY ROLLER CONVEYER

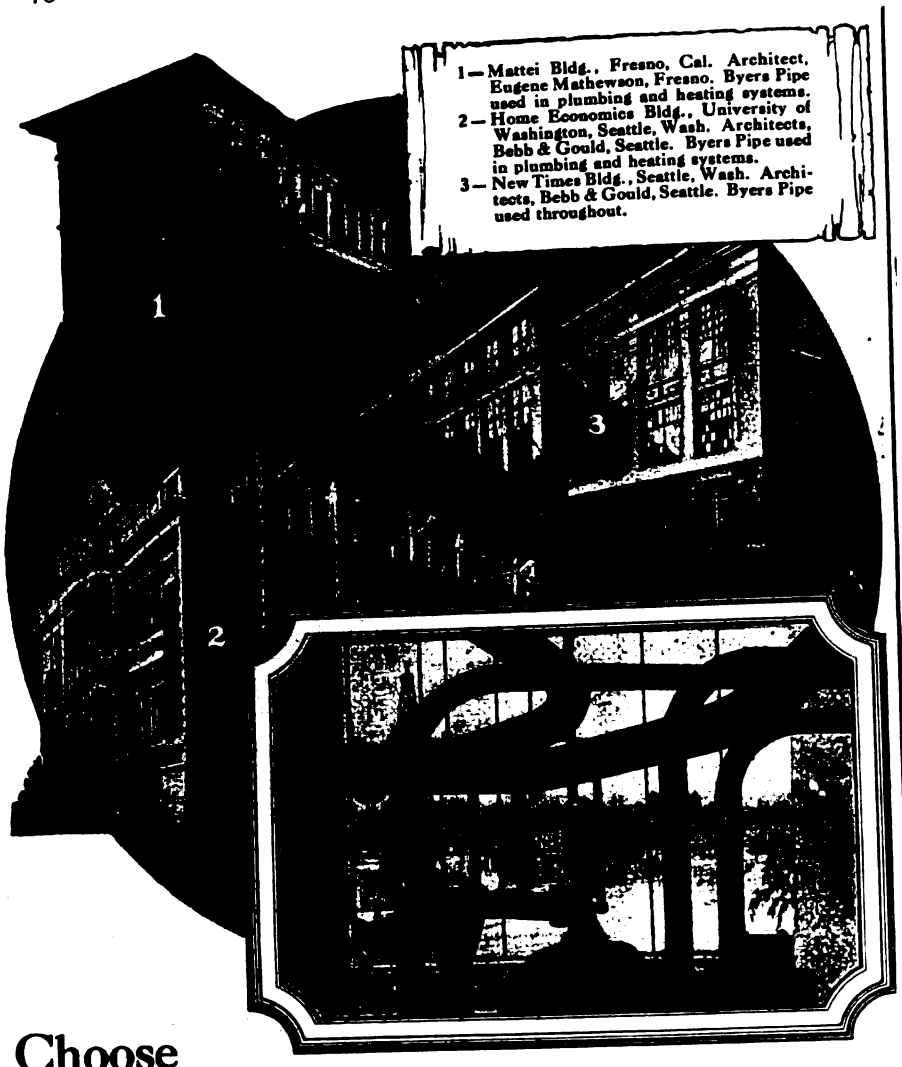
provides the simplest and most satisfactory utilization of gravity for conveying that can be had. It is the logical and lasting solution of your conveying problems and raises the general efficiency of your plant. It is manufactured in portable sections which make a flexible system readily adaptable to all parts of your building. Switches and other ingenious devices permit the routing of different products at will.

It is imperative that manufacturers take measures to offset labor shortages. The installation of a Mathews Gravity Roller Conveyer is a safeguard that pays for itself in labor saved. Our engineers are prepared to study conditions in your plant and estimate on the conveying system particularly adapted to your needs. Their advice places you under no obligation.

Write for further particulars.

MATHEWS GRAVITY CARRIER CO.
157 Tenth St., Ellwood City, Penna.
Branch Factories: Toronto, Ontario—London, England

Digitized by Google



Choose Your Architect or Engineer Wisely— *Then Rely on Him!*

EVERY so often we hear owners and managers of comparatively new buildings say: "We use Byers pipe for all replacements. If we had known as much about pipe when this building was put up as we do now, we would have used Byers pipe in the first place."

Frequently this statement comes from people who have disregarded the advice of their architect or engineer on the subject of pipe material.

The experience of these owners and managers with cheap pipe, ultimately makes them more confirmed believers in the economy of using Byers pipe than those who are fortunate enough to install Byers pipe at first, and who, therefore, miss the valuable, though exceedingly costly, experience which follows the installation of pipe lacking in rust resistance.

The replacement cost of plumbing, heating and power piping installed in buildings or laid underground, is staggering.

Good architects and engineers know this, and specify Byers to protect their client's investment as well as their own good name. Where such specifications are lacking, competitive bidding invariably leads to the installation of the cheapest pipe obtainable.

Byers Bulletin No. 38 contains Analyses of Items of Cost in a variety of pipe systems, with notes on replacement costs and corrosive conditions. Sent free on request.

A. M. BYERS COMPANY, PITTSBURGH, PA.
Established 1864

New York Philadelphia Boston Chicago Cleveland Houston

BYERS PIPE

GENUINE WROUGHT IRON

Look for the Name and Year rolled in length

(Continued from Page 7)

its exclusive use by the average individual or organization. ent stations attempt to use the other at the same time. And,

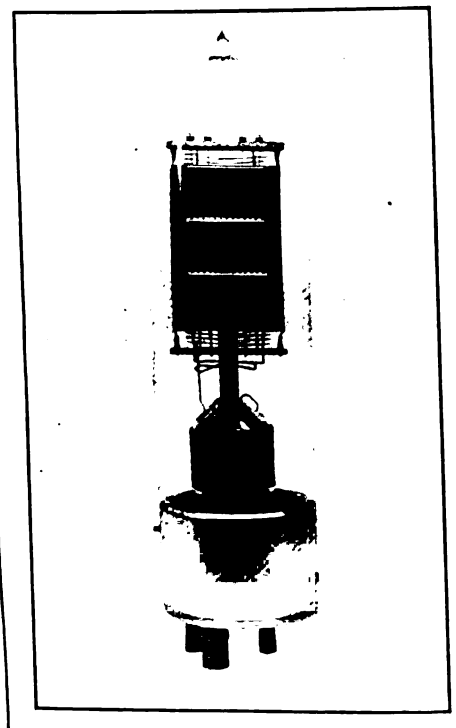


In the studio of "WBAY" every effort has been made to exclude echo in any form. Felt padding about the walls, and carefully planned arrangement get voice and music into the microphone with a minimum of distortion.

second, that the cost of installing, maintaining and operat-

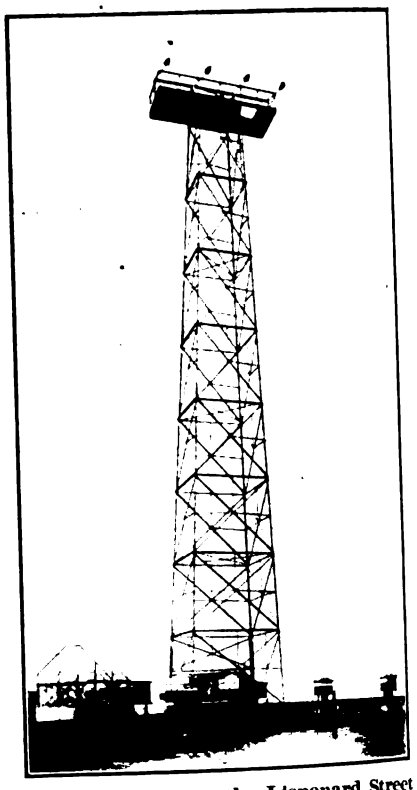
More and more it became evident that a demand had been created for a toll broadcasting service which might be used at stated intervals by organizations desiring such service for limited time. To meet this demand, the American Telephone and Telegraph Company set about the erection of one of the most modern and best equipped stations that the present state of the art permits. "WBAY" is the result.

From time to time the opinion has found expression that a station operating for hire like WBAY might work to the detriment of the broadcasting art. It was feared that a commercialization of radio broad-



The Western Electric 250-watt vacuum tube. These tubes operate at WBAY at a plate potential of 1600 volts.

casting might result which would tend to reduce the high quality and general interest of broadcasted programs. Such a result would be much regretted by all. In regard to WBAY all precautions are being taken to insure that its programs will meet with popular approval, and will consist of only such entertainment and other material as will have a general appeal. For it is a foregone conclusion that no one will wish to jeopardize his reputation by broadcasting what the radio audience generally does not care to listen to. Whether the motive be-



This tower, at the Lispenard Street end of "WBAY'S" antenna, is a hundred feet in height. It will stand a wind load of 5,000 pounds. The platform on top provides safety and comfort for men working aloft.

hind the broadcasting is to advertise merchandise or a public movement, or a candidate for public office, the fundamental requirement for the material will be wide popular interest.

Taking up the equipment in the order in which the sound waves pass through on their way etherward, let's step into the studio first. As you enter the room you notice at once that something about it is different. Your voice sounds unnatural to you. And the voices of your companions come to you more clearly enunciated than they did a moment before in the hallway. The room is echoless! This has been accomplished through the use of felt padding on the walls and parts of the ceiling, and by

Digitized by Google

giving special attention to the arrangement of the room.

Like all the rest of the electrical equipment used in the station, the microphone was designed and manufactured by the Western Electric Company. With the type of microphone employed at "WBAY" it is not necessary for the



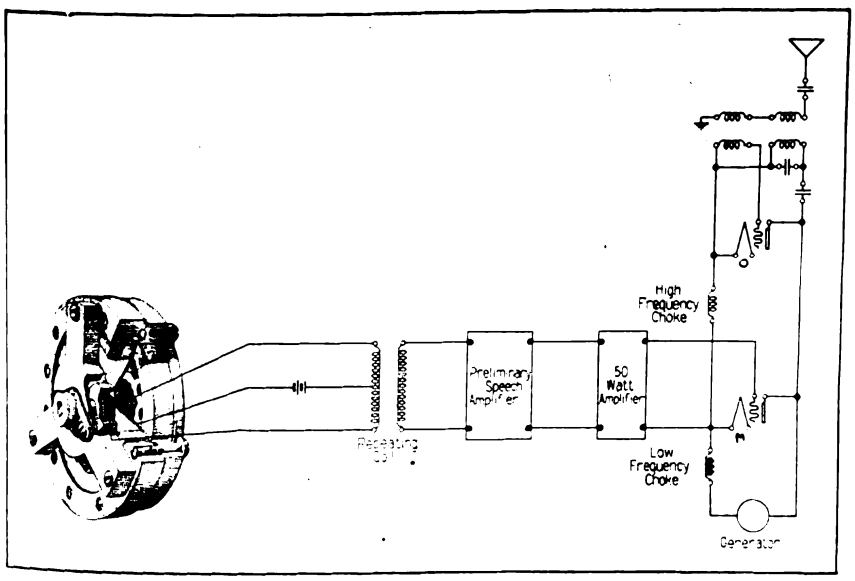
The sensitive microphone or telephone transmitter which is used in the studio to convert the sound waves of music and speech into electric waves. These are amplified many millions of times and radiated from the antenna.

speaker or singer to stand close to the instrument—a condition which adds materially to the ease of performance on the part of the artist. As one of our illustrations shows he, or they, may stand several feet away.

Two buttons, or carbon granule chambers characterize the Western Electric microphone used in this station. One button is located on each side of the vibrating diaphragm, so that at any given point in the vibration of the diaphragm, one buttom is compressing carbon granules while the other is releasing pressure. This means that current flow, affecting voice transmission, is being increased on one side of the diaphragm and decreased on the other.

Every fan who has studied the action of the single button microphone knows that its results are not exactly proportional to the amplitude of the sound waves producing them. Some distortion takes place. With the two-button device this distortion is cuut down tremendously. From the wiring diagram it will be noted that the two buttons of the microphone are connected with one side of the transformer—or in telephone language, the repeating coil—in such a way that the resulting currents are both in the same direction and their combined effect is the production of waves that are quite free from distortion.

Another interesting feature of this microphone is the method of damping the vibration of the diaphragm by means of air holes, through the framework. These air holes give access to a cushion of air that is only about 1/1000 of an inch thick between the diaphragm and the body of the transmitter. As the diaphragm vibrates, air is rapidly pumped in and out of this cushion. Ordinarily one does not think of air as a viscous fluid. At high vibration periods however the diaphragm finds the air of considerable viscosity and the pumping effect which results from this "air pump" action renders the instrument



Circuit diagram from push-pull transmitter through the speech amplifiers to the radio set. The Heising system of modulation is used. By the use of a microphone with two buttons working in opposite phases and joined to the repeating coil as shown, practically all of the distortion of the ordinary microphone can be eliminated.



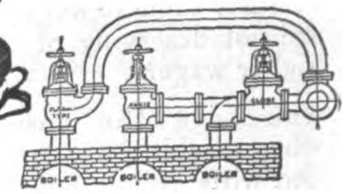
DOUBLE EXTRA HEAVY VALVES

"Every Valve Sold with a Positive Guarantee."

"Hosts of References."

"No Shut Down when a Boiler Tube Bursts."

"The Heaviest Valve Made"



4100

Golden-Anderson Life and Property Insurance Valves are used in the iron and steel industry. Their repeat orders are the result of assured protection.

GOLDEN-ANDERSON

"Life and Property Insurance Valves"

Patent Automatic Double-Cushioned Triple-Acting and Non-Return Valves

1. They will automatically cut a damaged boiler out of service—making it impossible for live steam to pour back into it and cause a disastrous explosion. The other boilers are left intact, and can be continued in operation.
2. They will automatically shut off the steam flow from all boilers the moment that a pipe ruptures, thereby eliminating a pipe explosion.
3. A fresh boiler is automatically cut into the line, eliminating the serious danger involved when doing this by hand.
4. The pressure is automatically equalized between all boilers.
5. No steam can be turned into a cold water boiler, thus protecting men working inside.
6. Fitted with double Corliss dashpot which insures perfect cushioning in opening and closing.
7. No pounding, sticking or spinning
8. The only valves that can be tested in service.

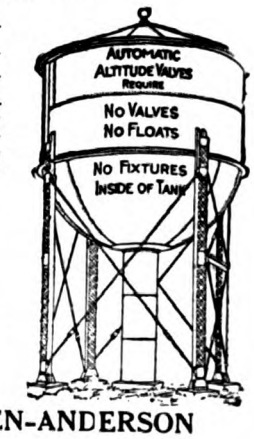
Golden-Anderson Automatic Cushioned Controlling Altitude Valves



For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. Three Ways of Closing "These Valves."

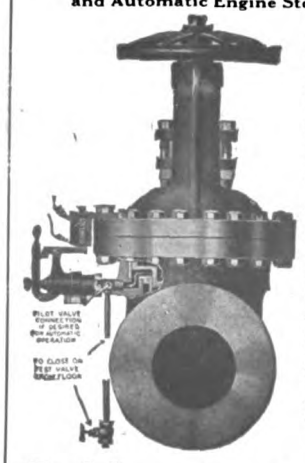
1st—Automatically by Water.
2nd—By Electricity, if desired.
3rd—By Hand.

May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.



GOLDEN-ANDERSON

Pat. Cushioned Combine Throttle and Automatic Engine Stop Valves



1—Can be operated by electricity from distant points insuring instant checking of steam to runway engine, or any part of the entire plant piping system.

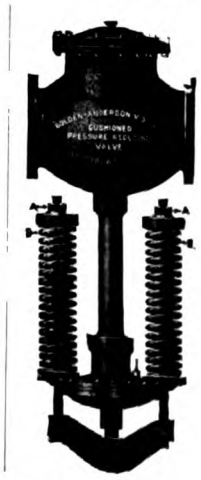
2—Equipped with double Corliss Dash Pots. No chattering, pounding or sticking is possible.

3—Double extra heavy construction; occupy minimum head room.

4 Sizes up to 20 inches.

GOLDEN-ANDERSON

Fat. Automatic Cushioned Steam Pressure Return Valves



Constant reduced pressure at all times.

Safe Operating Piston makes it impossible for high pressure to enter into low pressure service. Thoroughly cushioned—no hammering, chattering or sticking.

No auxiliary valves or small by-pass—

Double extra heavy throughout—Practically indestructible.

Only one adjustment—on the outside.

Golden-Anderson Valve Specialty Co.
1306 Fulton Building Pittsburgh, Pa.

Digitized by Google

"Seniority Status" or Production Basis?

Are you paying some workmen what they're *assumed* to be worth to you, by virtue of seniority in employment?

Do you know what they're actually worth on a *production* basis—or whether some newer men are not deserving of the higher wage?

You have the answer when machines are equipped with—

Veeder COUNTERS

You then see how each workman sizes up compared with the others; how he really ranks in competence and how he *ought* to rank in the wage scale.



The above Revolution Set-Back Counter records the output of any machine where a shaft-revolution indicates an operation. Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figure-wheels, as illustrated, $10.00—subject to discount. *Cut less than one-half size.* Set-Back Rotary Ratchet Counter, to record reciprocating movements as on punch presses, $11.50 (list). Smaller counters at prices from $2.00 up.

This small Rotary Ratchet Counter (No. 6) counts reciprocating movements of the lever, as required in recording the output of many small machines. When the lever is moved through an angle of 40 to 60 degrees, the counter registers one. A complete revolution of the lever registers ten. This counter is adapted to no end of counting purposes, simply by regulating the throw of the lever. Price, $2.00. (*Cut nearly half size.*) Small *Revolution* Counter, to record revolutions of shaft, also $2.

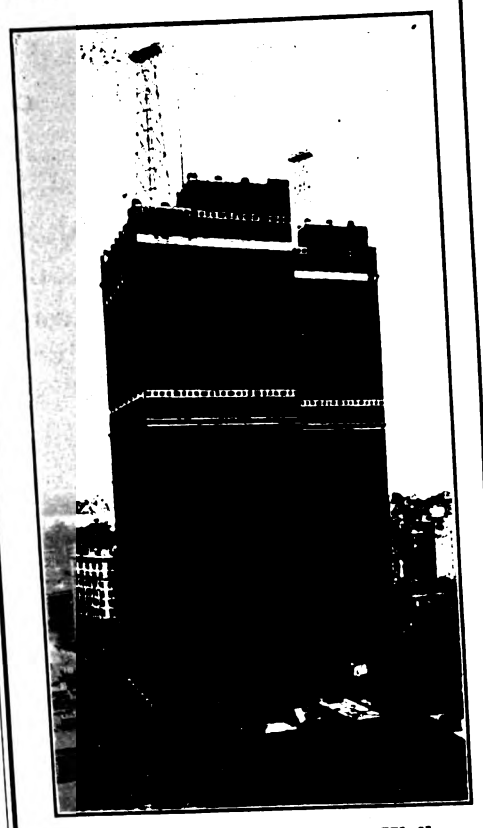


You can apply the "counter test" at all your machines where you'd like to appraise your workers. Send for the Veeder booklet and see just the counters suitable.

The Veeder Mfg. Co.,
63 Sargeant St., Hartford, Conn.

almost equally responsive to all vibration periods over the whole range of speech and music.

The electrical equipment is so arranged that another type of transmitter may be used when desired. It is not a "microphone" at all but what is generally known as a condenser transmitter. It contains no little cups of carbon granules which characterize the microphone although it has a vibrating steel diaphragm and makes use of air damping. It requires considerably more preliminary amplification than the microphone but it has certain characteristics which at



Already a landmark in the Walker Street section, the Telephone Building has taken on new skyline interest since the installation of its aerial for "WBAY," the new toll broadcasting station of the American Telephone & Telegraph Company.

times make its use desirable.

A glance at the circuit diagram will show how the electric waves generated in the microphone by the sound waves are led, first to the input amplifier and thence to the radio transmitter. The input amplifire contains three small tubes and one 50-watt tube and the transmitter uses two 250-watt tubes as oscillators and two others as modulators. All of these tubes employ the oxide coated filament which gives a very copious electron emission at a dull red heat. The system of modulation is of the Heising type and the general circuit arrangements are given in one of our accompanying illustrations.

To Executives who know the value of TIME—

Keep your business at your finger tips by being in *instant* communication with all departments.

Ask us to demonstrate the money-saving value of Callophone Service right in your plant, anywhere within a hundred miles of New York.

Hundreds of leading industries are now using it, and testify to its indispensability.

Write for details.

CALLOPHONE COMPANY OF NEW YORK
Cor. Grand and Lafayette Streets
New York

CALLOPHONE

G.P.&F. Service

A means towards lower production costs



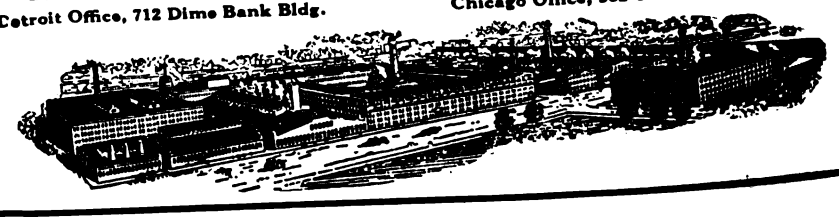
We can make your STAMPINGS and SHEET METAL PARTS in any quantity better and at less cost than they can be made in your own plant.

It has been a revelation to many manufacturers who *did not know* they could use STAMPINGS to advantage. It has displaced Castings, Forgings and Wooden Parts and in some cases entirely eliminated machining and fitting—a decided saving in itself.

Our organization has the experience of 41 years in this work. A 15-acre plant containing whole batteries of high speed specially equipped presses are at your service. They are adapted to a wide variety of work.

It will pay you to send blue prints or samples for estimates on Stampings, Forming, Drawing, Punching, Pressing and Spinning in Steel, Aluminum, Copper, Zinc, Brass or Tin.

Geuder, Paeschke & Frey Co.
1450–1750 St. Paul Avenue, Milwaukee, Wisconsin
Detroit Office, 712 Dime Bank Bldg. Chicago Office, 352-358 W. Ohio St.



Digitized by Google

Sand—a Magic Substance

(*Continued from Page 19*)

closer together, but finding entrance into the pores. In this way the individual grains are united with the cement and the result is a very compact and well-nigh indestructible whole. In cases where the exclusion of moisture is desirable the harder siliceous sands are preferable.

In the manufacture of concrete it is important, where strength is desired, that the grains of sand should not be worn and rounded nor all of the same size, since smoothness of surface and regularity of size mitigate against adhesion. The usual method is to mix sands from various screenings, which causes the mass to dovetail together with the least possible number of voids.

The basis of all glass is sand, and glass besides serving as the medium for allowing sunlight to enter buildings is used quite extensively as a fire-proofing material. In the form of bricks it has also been tried out for construction purposes. A building, particularly a home, constructed almost entirely of glass would, of course, be an ideal structure from the standpoints of light and cleanliness. Also, being a most indifferent conductor, it would act as a protector of interiors against extremes of heat and cold. But unfortunately the glass brick is not only expensive to manufacture, but is very easily broken or chipped, two disadvantages which offset all its other desirable qualities. Cast glass tile, however, has been used with considerable success. The only trouble is that once the surface is scratched, it fractures easily, and in order to prevent this it is necessary to make the glass tile very thick.

In the manufacture of glass the molten mass is either blown, rolled or pressed; in the latter case it is poured into a mold. A very high grade of window glass, such as is manufactured in a natural gas tank furnace, is composed of a mixture of 100 pounds of sand, 39 pounds of salt cake (sulphate of soda) 30 pounds of crushed limestone, 2½ pounds of ground carbon, and 1 pound of arsenic.

The sand blast, first mentioned in this article as one of the many uses of sand, has an almost incredibly large number of uses in the manufacturing arts. It is used by silversmiths to create the delicate frosted designs on silverware. The article to be decorated is covered with a stencil or pattern of rubber or some other yielding material and then the sand blast is applied. The biting, corroding sand attacks the exposed parts of the silver vessel only, thus producing the desired design. Ground glass, which is used in cameras and for many other purposes, is produced in the same manner.

Sand for cleaning iron, steel, brass or other metal castings is invaluable. Where structural iron work is to be cleaned, preparatory to painting, nothing is so effective as the sand blast. The surface of the metal when scoured in this way presents a porous face for the paint to enter, and for this reason one coat of paint lasts a long time. The paint must be applied immediately after the sand blast is used, however, as the surface soon begins to scale, due to oxidation of the metal.

Nothing is so effectual for use in public filtration plants as sand. In fact, modern sanitary engineers would hardly be able to get along without it. It does the work of cleansing water of bacteria, filth and other alien matter much more effectively than anything yet discovered. In some cities pure water is obtained from streams which are often muddy or pulluted with sewage by drawing the water from wells sunk below the river bed. The sand of the river's bottom, which is often several feet deep acts as a filter, sifting out and holding fast all material dangerous to the health of the public. A natural filter of this sort is not, however, as satisfactory as one built under the direction of skilled sanitary engineers.

At Aspinwall, near Pittsburgh, one of the largest and most successful filtrations plants in the coutnry thoroughly cleans some 120,000,000 gallons of water daily. This is what is known as a "slow sand" filtration plant. There are more than fifty filter beds, in each of which are thirty inches of sand, and beneath this twelve inches of gravel and assorted screenings. This plant

Moving Ash With Measured Steam

Moving ash with measured steam is made possible by the new Green Engineering Company development "REMOTE CONTROL."

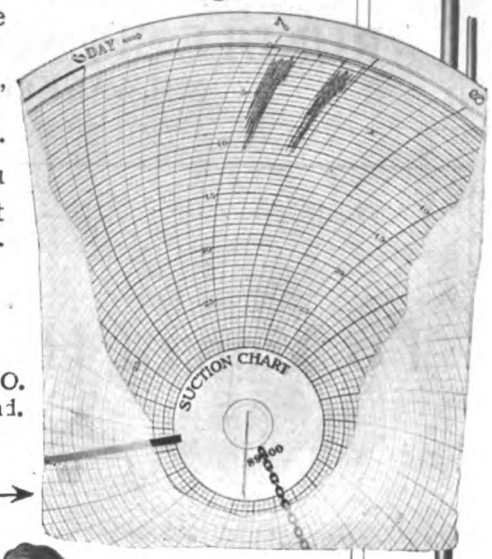
Remote control consists of an electrically operated steam valve which is controlled by the man hoeing the ash into the conveyor intake. This control can be fitted to old and new steam jet ash conveying systems alike.

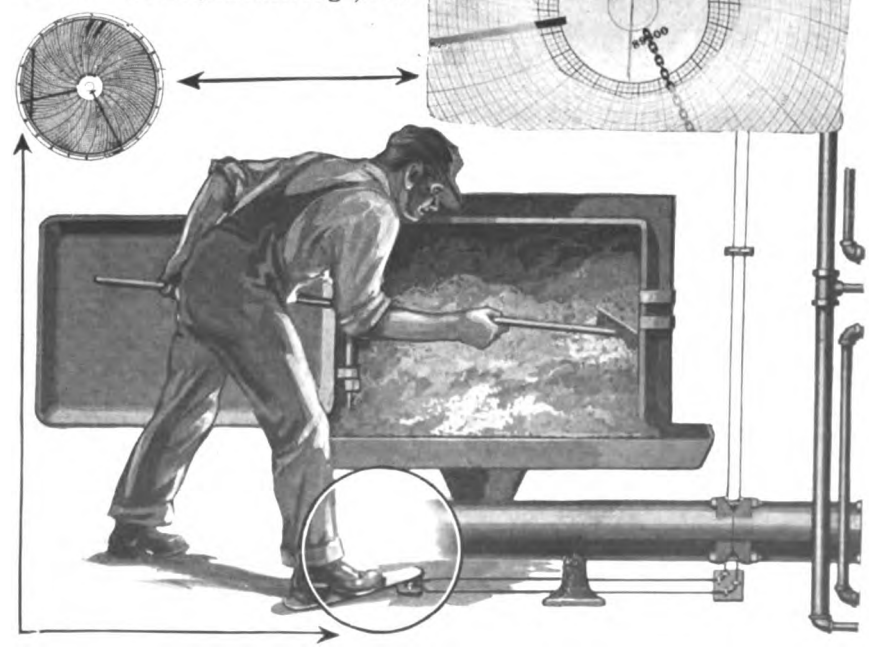
Remote control is the answer to "excessive steam consumption." It makes the steam jet ash conveyor the cheapest as well as the cleanest and quickest method for the removal of ash from the boiler room.

It makes it convenient for the operator to use steam only when he is actually hoeing ash into the system. It gives a tell tale record if he mis-operates.

"Remote Control" saves half the steam.

Let us show you more about steam jet ash removal under this new system.





GREEN ENGINEERING CO.
210 Kennedy Ave., East Chicago, Ind.

Green Chain Grates

Digitized by Google

"VERTICO-SLANT"
DRINKING FOUNTAINS



Relieve fatigue and aid production

in your plant by furnishing continuous supply of clear pure water.

The R & S Metal Body Factory Coolers are built for long service and heavy duty containing 92 ft. heavy coil. Cork Insulation saves the ice—the water is chilled but does not come in contact with the ice. And the VERTICO-SLANT Stream is an absolute safe-guard against contamination.

Write today for prices.



"Lips cannot touch the nozzle"

RUNDLE-SPENCE MFG. CO.
MILWAUKEE, WIS.

To Men of High Standing

WE can use the services of a limited number of men who are accustomed to dealing with industrial executives. Our preference is for those who have had experience as production or personnel managers, as industrial engineers, as salesmen to ndustrial concerns, or in related lines.

Our work is more fully presented in an advertisement on another page of this issue. We conduct a well-rounded program of foremen training which has already made good in over five hundred pl ts. Its remarkable record of results is thoroughly convincing.

Only men of high standing and ability can represent us successfully. Their compensation is fair and may run into large figures.

If you are interested write at once in strict confidence to:

William H. Lough, President
Business Training Corporation
185 Madison Avenue, New York

cost about seven million dollars and has resulted in reducing the death rate at Pittsburgh from typhoid to a very low percentage.

In sewage disposal beds, sand acts as in water filtration plants. For this purpose, the sand of the sea dunes is declared by engineers to be the best. This must be selected with great care, however, inasmuch as it must be free from loam, clay or other inorganic impurities. Gravel is first laid over the under drains of the sewage beds. Upon this is placed the sand. The purpose of the gravel is to prevent the sand from working down into the drainage pipes, through the joints. For such a purpose as this, sand has no intrisic qualities of its own. It acts mechanically, as a strainer. In addition to this, however, it also offers a harboring place for nitrifying bacteria, that is, the bacteria which convert the ammonia of the decomposing vegetable or animal matter into nitrates. The sand also holds oxygen for these bacteria, though those that burrow deep beneath the surface, far from the sunlight and air, need but very little.

Deposits of sand suitable for building purposes vary in size, just as do deposits of stone, but in general they are of wide extent and a field that is considered worth working for commercial purposes will cover fifty acres or more. The depth of a sand and gravel deposit, for a pure sand deposit is seldom found, may be anywhere from forty to a hundred feet. When operations are first started a separating mill and elevator is built at a certain point. From there a railroad extends to the pits, its progress following that of the steam shovels which dig up the sand and load it directly into open freight cars. The loaded cars carry the sand and gravel to a dump located near the mill, from where it is conveyed by a belt conveyor to the top of the mill. The belt conveyor shown in the illustration is 350 feet long and the top of the mill 90 feet high.

At the top of the mill are a number of cylindrical steel screens of varying degrees of fineness. The sand and gravel enter these screens direct from the belt conveyor. As the steel cylinders revolve, streams of

(Continued on Page 53)



"AS PER PHOTOSTAT Copy HEREWITH"

This phrase is coming into general use in business offices, because each day another company realizes that the PHOTOSTAT way is, for many purposes, the quickest, the most economical and an error proof method of copying. The PHOTOSTAT method costs cents where other methods cost dollars, produces at a possible speed of one copy per minute, and

The PHOTOSTAT makes no mistakes. It makes photographic facsimiles.

When it is necessary to show valuable documents in some business transaction and you do not wish to send the originals out of the office. PHOTOSTAT copies are equally acceptable as they are legal evidence in court.

But the uses for the PHOTOSTAT do not end in the office. The PHOTOSTAT is also used in the production department. Here it eliminates the necessity of making tracings, as it copies direct from blueprints, pencil sketches, ink drawings or even from the original object, within certain limits of size.

It is the numerous and valuable uses of the PHOTOSTAT which in many cases pay for the installation in less than six months.

Write or telephone our nearest office.

PHOTOSTAT CORPORATION
295 STATE ST., ROCHESTER, N. Y.

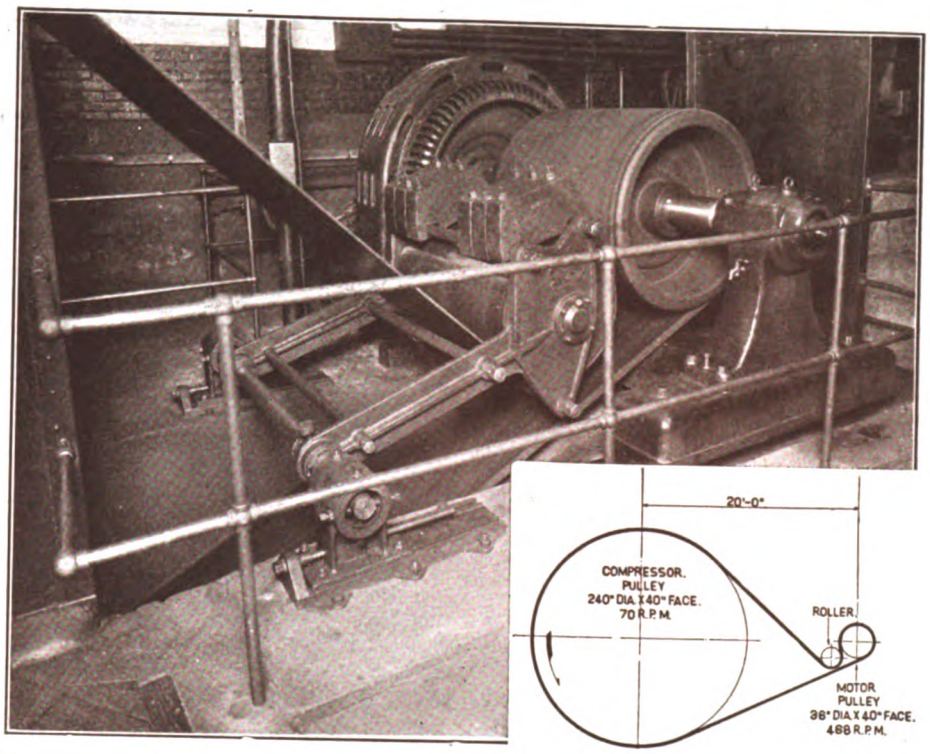
88 Broad St., Boston
123 W. Madison St., Chicago
209 Leader Bldg., Cleveland
7 Dey St., New York City
510 No. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington.

Executive Office: Providence, R. I.

PHOTOSTAT
Trade Mark

Digitized by Google

The Korap* Lenix Drive



500 H. P. Motor Driven Ammonia Compressor, Motor Pulley 36" Dia., 40" Face, 468 R. P. M. Compressor Pulley 240" Dia., 40" Face, 70 R. P. M. Double Leather Belt, 39" Wide, 7/16" Thick.

In changing from steam to electric drive, the owners of this 500 H. P. motor driven ammonia compressor were confronted with the problem of installing a belt drive in the space occupied by the old steam engine. The floor space was limited and an ordinary open belt drive would not give sufficient arc of contact of the belt on the motor pulley to transmit the load.

The KORAP LENIX solved the problem.

Note the large arc of contact of the belt on the motor pulley obtained with the KORAP LENIX, insuring the transmission of the maximum load without belt slippage.

There is no flapping of the belt, as the KORAP LENIX automatically follows the peaks and valleys of the load with a corresponding increase and decrease in the arc of belt and pulley contact, synchronous with the variations.

The proper tension in the slack side of the belt is maintained constantly by the KORAP LENIX irrespective of atmospheric and temperature changes.

Bearing pressure is minimized, saving in bearing friction, lubrication and renewal of bearings.

Booklet "Saving Slippage and Space," describing other interesting KORAP LENIX installations will be sent on request.

F. L. SMIDTH & CO.

Engineers

50 Church Street — **New York, N. Y.**

***Improved LENIX Drive.**

Digitized by Google

BAR BUILDING

An Office Building for Lawyers

36 W. 43rd St., Through to 37 W. 44th St., New York

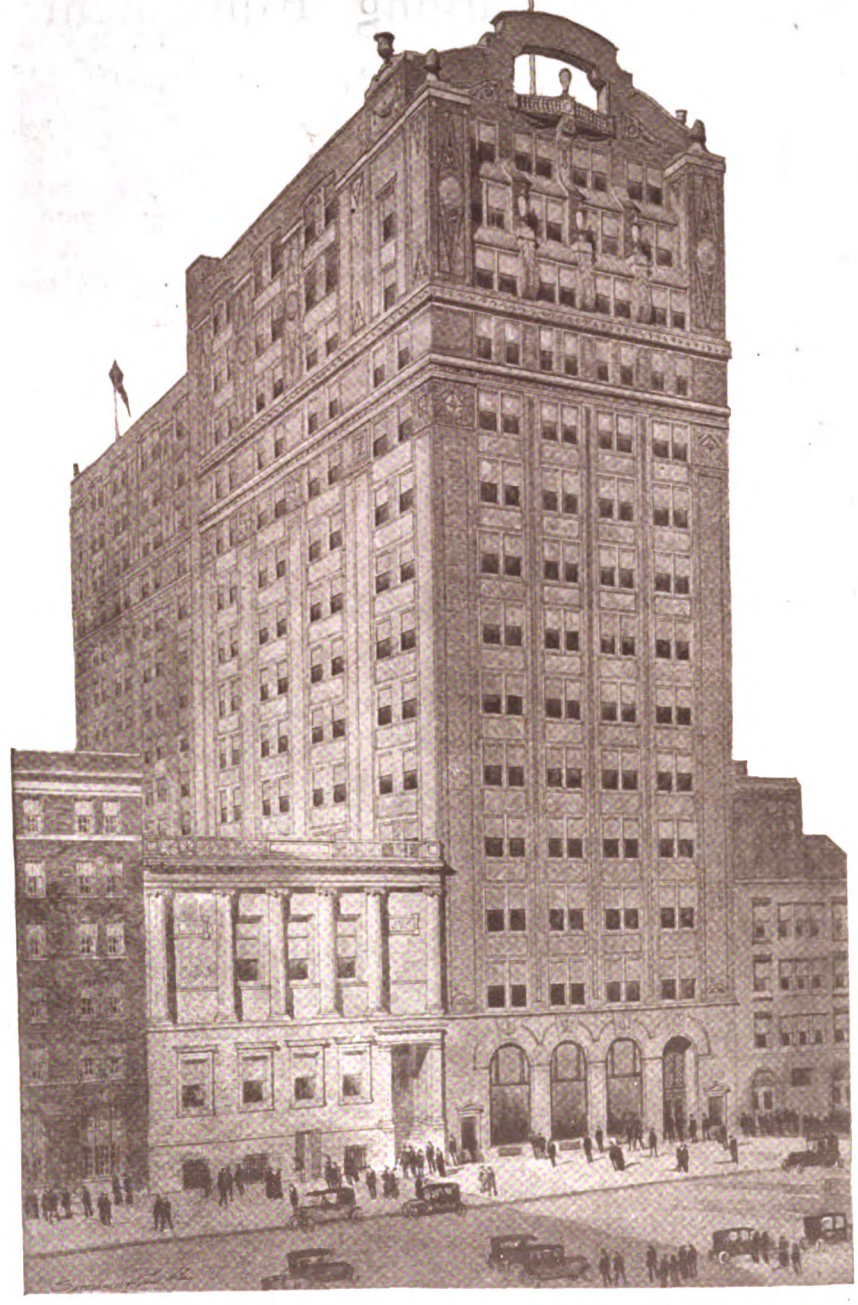
Charles L. Fraser
Building Contractor
372 Lexington Ave., N.Y.

Knickerbocker Fireproofing Company.
Floor Arches
and Concrete Works
56 West 45th Street, N.Y.

S. H. Sweeney
Heating & Ventilating
Contractor
213-215 E. 44th St., N.Y.

Fish Brick Sales Co.
Face Brick Contractors
25 W. 45th Street, N.Y.

Campbell Metal Window Co.
Metal Windows
8 West 40th Street,
New York



Severance & Van Allen ---- *Architects*
372 Lexington Avenue, New York City.

Gurney Elevator Co.
Elevator Contractors
300 Eighth Ave., N. Y.

South Amboy Terra Cotta Co.
Terra Cotta
Contractors
150 Nassau Street, N.Y.

Hay Foundry and Iron Works
Structural Steel
15 Madison Sq., N. Y.

Farnum Plumbing Company
Plumbing Contractors
370 Lexington Ave., N.Y.

Construction and Foundation Corporation
Rock Excavating and Foundation Work
372 Lexington Ave.,
New York City

STORES and three lower floors will be open to commercial tenants. Directly connected with the House of the Bar Association which has over 2600 members. This is the first Professional Building for attorneys in New York. Space is being rapidly absorbed by prominent men of the Profession. This building will be an asset to your business. The large store and mezzanine has frontages both on 43d and 44th Streets and display along the entire course of the Arcade which connects the two Streets.

For further Information Address Burton Thompson, Managing Director

BAR BUILDING INC.,

372 Levington Avenue, New York City

Digitized by Google

Just Suppose-

You Had Coming to You Every Month

A Big Bunch of Pictorial Progress

Such as you see in this copy of Industry Illustrated?

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted —but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This Coupon is for YOU— Use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name.....

Mailing Address.....

.....

Company.....

Position.....

(Important confidential information—for our own records only)

ANNUAL SUBSCRIPTION $1

(In Canada, $1.25; Foreign, $1.50)

(AD-D)

(*Continued from Page 50*)

water are directed against them and the sand is washed out and down wooden chutes into the storage elevator, the gravel, of course, remaining inside the screens, which are emptied from time to time. The streams of water also have the effect of washing away any dirt that might be in the sand, so that the latter reaches the storage bins perfectly clean. All that is necessary then is to give it time to dry out, after which it is drawn out of the storage bins into freight cars, as needed, very much in the same manner that grain is unloaded from a grain elevator.

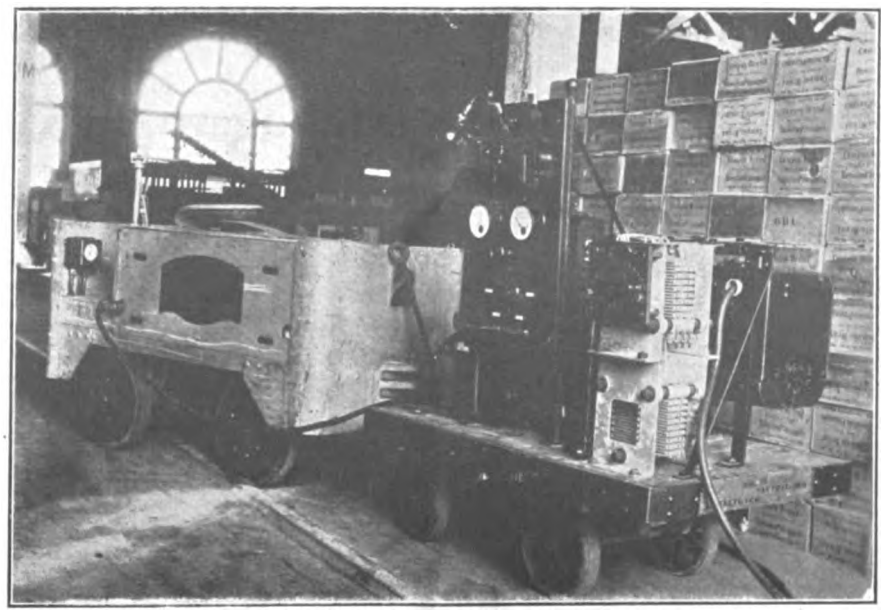
Portable Charging Equipment for Electrically Operated Tractors

THE California State Harbor Commission is now operating two specially designed portable charging outfits, which consist of special battery-charging equipment mounted on a four wheel truck, used in charging the various electrically operated tractors owned by the Harbor Board. The charging equipment was made portable so that it could be towed from pier to pier for use at the point where the electric tractor is being used. This portable feature is also of great value, because, since it enables the charging equipment always to be handy for charging the tractor at the point where the tractor is being used, it saves time and current in going to and from the permanent charging station. Inasmuch as the charging equipments is fully automatic in every particular all that is necessary for placing the equipment in charge is simply the connection of the charging plug to the battery and the closing of the motor breaker.

The charging rate is adjusted once and for all and no further adjustment is necessary. The design of the machine automatically maintains a constant charging rate, which is a prime essential in getting the best results from batteries.

The illustration on this page shows the portable battery-charging outfit connected with one of the electric tractors for recharging. After the charging process is started the operator does not have to give it any attention whatever. When the battery finally becomes fully charged it is automatically disconnected from the generator, the motor generator-set is automatically disconnected from the line and the whole equipment is at a standstill. In the event that power to the motor generator should fail, the battery is automatically disconnected from the generator, and the motor-generator set comes to a stop.

Upon the return of current to the motor the motor-generator-set automatically starts up and the battery is automatically connected back on to the charge. This may occur once, or several times, and still the apparatus functions the same. Finally, when the battery be-



Portable charging outfit, charging batteries on electric tractors "on the job."

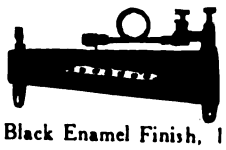
Is It Worth Saving

14% to 19% of Your Boiler Room Costs?

In view of the coal strike and the impending shortage and high prices your boiler room should receive greater consideration than ever before.
Hays Apparatus enables you to visualize what is actually happening in the boiler room. A Hays Recorder cut 15% of the fuel bills of the City of Moorehead, Minn.; 19% for Capital Elevator Co., Duluth and 14% for the Ft. Scott Public Utilities, the latter using oil for fuel. All over the country substantial savings have been reported through the use of Hays instruments.

Hays Draft Gage

for the boiler front tells the firemen how to regulate the damper, the condition of the fires, baffles, settings, etc



Black Enamel Finish, 1 in. range $14

The Hays Improved Gas Analyzer



with its special metal needle valves instead of glass cocks, pinch clamp or rubber connections—the Hays patented steel wool method of absorption—its heavy molded glass parts held by packing nut connections and its compact rugged construction is the finest instrument of its kind on the market. CO_2 analysis in 30 seconds. Complete analysis for CO_2, O_2 and CO in 4 minutes. Accurate to 1-10 of 1%. Three chamber analyzer $40, CO_2 only analyzer $30.

The Hays Automatic CO_2 and Draft Recorder



tells the complete story of furnace conditions. Firemen have the facts right before them. It gives them a chance to stop the wastes and losses before they start. This instrument pays for itself in a short time by the saving in fuel. If you are interested in fuel saving fill in the coupon below and mail it in today. Our book "Drafts and Draft Regulation" will be sent together with further information.

The Jos. W. Hays Corporation
Combustion Efficiency Appliances
1038 E. 8th Street Michigan City, Ind.

The Jos. W. Hays Corporation
1038 E. 8th St Michigan City, Ind.

Please send me "Drafts and Draft Regulation" and information about Hays Apparatus.

Name.....

Company.....

Address.....

Digitized by Google



Temperature Instruments

In home or office, in the city or on the farm, in laboratory or factory, on land or sea, at high altitudes or in mines below the earth's surface, there's a *Tycos* or *Taylor* Temperature Instrument for every purpose.

Industrial Straight and Angle Stem Thermometers; Self Contained Recording Thermometer; Mercury Recording Thermometer; Refrigerating Engineers Testing Set; Engraved Thermometers; Hydrometers; Air Compressors; Mercury Column Vacuum Gauge; Mercury Column Absolute Pressure Gauge; Dairy Thermometers. A catalog awaits your request if you specify your industry.

Taylor Instrument Companies
Rochester, N.Y. U.S.A.
There's a Tycos and Taylor temperature instrument for every purpose

S-312

comes fully charged it is automatically disconnected from the generator and the motor generator set is disconnected from the line.

The entire equipment is fully protected against overloads. The motor is protected against overload and single phasing by means of oil circuit breaker equipped with dash-pot time element overload coils; the generator is protected against overload by means of single-pole carbon circuit breaker.

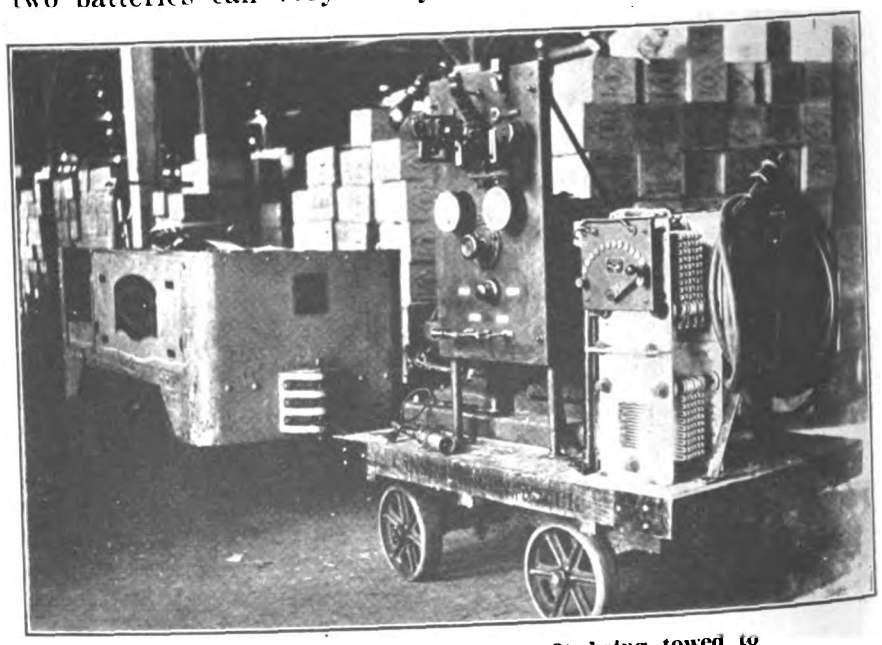
The charging equipment is mounted on two rubber-tired trucks on which special provision has been made for towing by a tractor to whatever docks it is desired to use the charging equipment.

One of the charging equipments has an additional feature, which is the ability to totally discharge the batteries of any tractor when occasion demands.

Batteries can be fully charged on any electric tractor in from 5 to 6 hours. Thus, two batteries can very easily be charged with one of the portable charging equipments during a 24 hour period, allowing 8 or more hours for service of the tractor.

The electric tractor, which tows the charging unit, is owned by the Harbor board. It has a ten ton trailer capacity, and a speed of 5 miles per hour. This tractor is provided with three trailers having a capacity of 6,000 lbs. each. Each trailer is equipped with a Y-shaped hook coupling of forged steel, fitted with elongated eyes so that it will rest in a vertical position when not in use. A catch is provided to prevent uncoupling when going down an incline.

The equipment is used by various concerns along the water front who do not have sufficient business to warrant the purchase of their own equipment. The Harbor Board makes a schedule and furnishes the tractor and trailers and operator and charges the user a stated hourly rate for their use.



Complete Portable charging outfit being towed to new location.

Mahogany—King of the Jungle

(Continued from Page 24)

he plans to "fell" the tree. Once the thick undergrowth is chopped away the cutter finds his tree so buttressed with great roots that he must oftimes build a scaffold from eight to twelve feet high about the body of the tree and cut from this height. This means the loss of much valuable wood, but it is the only way in which the Indian with his primitive tools can accomplish his purpose.

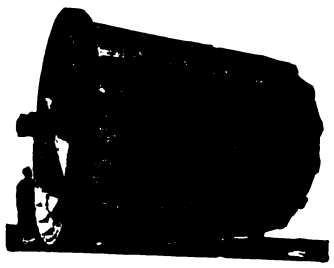
Once down, the king of the south woods is stripped of his great branches and the cutter begins the tedious, laborious process of hewing the great round log into a squared stick. This entails further loss of valuable wood, many times 20% to 30% of the log being thus sacrificed. If a certain cut of the log be 20 feet in length, the squared stick is only the sized log that may be cut from the small end of the round *troza*.

When the log has been finally

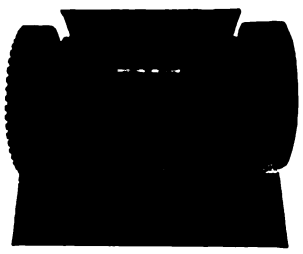
Digitized by Google

PUZZLING Reduction Problems Occur in Almost Every Industry

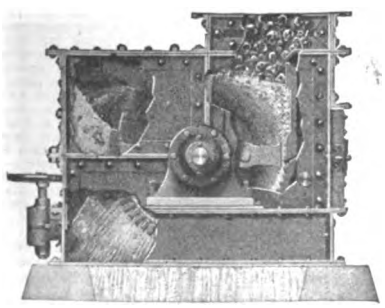
"Pennsylvania" Crushing and Pulverizing equipment has been specialized for crushing and cleaning Bituminous Coal for Power, Gas and Coking purposes, and for the primary, secondary and fine crushing of Cement Rock, Limestone, Gypsum, Ores, Sinters, Chemicals and other Materials of similar structure and hardness.



"Pennsylvania" Patented Bradford Coal Breaker and Cleaner for Coal Mines, By-Product Coke Plants, Central Stations and Gas Works.



"Pennsylvania" Single Roll Crusher for Industrial Power Plants, Gas Works and Coal Mines, in tonnages 10 to 500 tons hourly. (Patented.)



"Pennsylvania" Hammer Crusher for the fine reduction of Limestone, Cement Rock, Oyster Shells, and similar materials. (Patented.)

"Pennsylvania" Crushing and Pulverizing Machinery is distinguished by powerful steel construction, liberal proportions and thorough tramp iron protection, and is specialized for continuously delivering the specified quantity and quality of product in each class of service attempted.

Put your knotty reduction problems up to us.

PENNSYLVANIA CRUSHER COMPANY

Stephen Girard Building, PHILADELPHIA

NEW YORK PITTSBURGH

hewn into a squared stick, the exposed sides are carefully covered with slabs to protect it from the alternate effects of rain and sun. The cutter then hews his way through the tangled growth to another tree.

Caoba Leaves the Woods

When the rainy season has passed and the heat has, in a measure, dried out the dank, humid woods, come long strings of *bueyes,* or oxen, ten to fifteen yoke, dragging a low, crude cart with which to "snake" the seasoned mahogany *troza* from its century-old home in the forest, out through the narrow *callejones,* to the main road that has been cut into the jungle. Here they are left by the side of the way to await the coming of the *trinquivales.*

La casa grande, or the owners' home, always on the bank of one of the many navigable streams of this south-Mexican country, is probably ten to twenty miles from the spot where this tree grew. It is here, in the river, in front of the *hacienda,* that the logs are finally dumped and formed into a raft. During the rainy season the *trinquivales* (enormous, home-made, two-wheeled carts), are repaired or new ones are built, so that with the stopping of the rains the hauling begins.

Life in a Mahogany Camp

At midnight the *mayordomo* rings the big plantation bell. Presently gleams of light show through the sides of the wattle, palm-thatched huts of the laborers, grouped about the main house. It is time to start for the woods. While their women folk prepare a breakfast of *posole,* (uncooked cornmeal mixed with water into a gruel), fried bananas and *frijoles* (Mexican beans), the men hurry up to *la casa* where the *mayordomo* waits to measure out to each of them a little mahogany cup full of *aguardiente* (Mexican cane rum).

Thus fortified, the *peon* eats a scanty breakfast, carries with him a little sack of *posole* to last him the next twelve hours, and hurries off to the corral, the mules and the *trinquivales.* By one o'clock the queer cavalcade sets forth, the *capataz* leading the way on his favorite riding mule, the others following, seven mules to the cart and the drivers generally lifting



READ "The Freight That Failed"

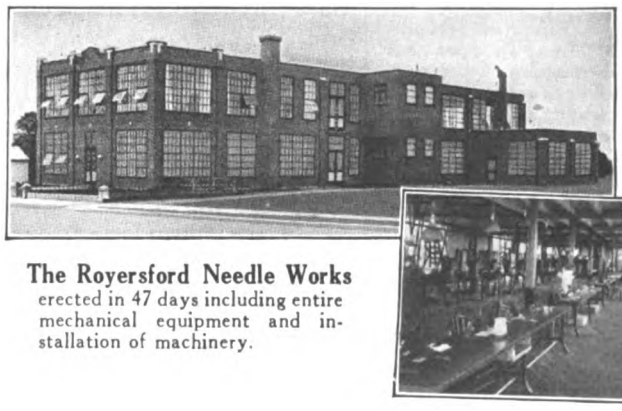
By Forrest Crissey

Every business man should read this illuminating article in the May 27th issue of The Saturday Evening Post. Mr. Crissey, in discussing the $100,000,000 annual freight claim losses, states that the use of stencils for addressing is a highly effective means of loss prevention. Read Mr. Crissey's article—then buy a Diagraph. Free trial in your own shipping room.

DIAGRAPH STENCIL MACHINE CORP.

1626 So. Kingshighway Blvd., St. Louis, Mo.

Branches in all principal cities—see phone book.



The Royersford Needle Works erected in 47 days including entire mechanical equipment and installation of machinery.

—INTERIOR—

Save By Building Now!

UNDER the Beling-Bush Method of Standardized Construction we can erect your building in from 30 to 90 days. You save on plans and specifications. Constructions costs are now low and, with America entering into greater building activity, now is the time to build while costs remain low.

Let us help you on your next building. Write for information and catalog.

THE BELING-BUSH CO., INC.

FACTORY ENGINEERS AND BUILDERS

Drexel Building Philadelphia, Pa.

THE SERVICE

Digitized by Google

TRUSCON STANDARD BUILDINGS

Meet All Needs

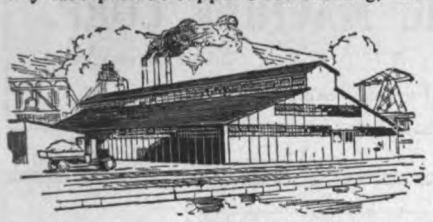
The purposes for which Truscon Standard Buildings are being used are innumerable. Their economy, permanence and adaptability are continually suggesting new uses. Made entirely of interchangeable steel units, they exactly fit individual needs.



Factories—In every industry Truscon Standard Buildings are being used not only for large factories, with cranes and monorails, but for storehouses, foundries, garages, time offices, cafeterias, etc. They provide ideal working conditions.



Shops—There is a type and size of Truscon Standard Building for every shop and manufacturing need. Permanent, fireproof, daylighted, well-ventilated, they also provide supports for shafting, etc.



Warehouses—Fireproof, economical in cost and quickly erected with minimum labor cost, Truscon Standard Buildings are furnished in all sizes and can be readily enlarged or re-erected in new locations with 100% salvage.



Garages—Truscon garages provide fireproofness, good ventilation, ample daylight, unobstructed floor space. Designed with any desired front—low in cost and upkeep.



Service Stations—Truscon service stations are good looking, fireproof and sturdy. They are readily dismantled and re-erected in new locations without loss.

Free Information—If you are planning to build, learn how a Truscon Standard Building can serve your needs. Return coupon for valuable suggestions and catalogue.

TRUSCON STEEL COMPANY
YOUNGSTOWN, O. Warehouses and Sales Offices in Principal Cities

Send useful building book and suggestions on building to be used for_____
Size____ft. long,____ft. wide,____ft. high.
Name_____
Address_____

their respective voices in a falsetto chorus or many times following the leadership of some local minstrel who improvises a word-story to some popular tune:

"La Cucaracha—La Cucaracha—ya no quiere caminar—"Porque le falta—porque no tiene—marahuana que chupar!"

Five hours dragging through a jungle trail shut in by a darkness denser than the jungle itself, until at day-break the caravan reaches the *trozas* that have been dragged out by the ox teams. Two hours during which these unwieldy blocks of timber are securely loaded by these simple workmen, using the most primitive methods, and then *posole* and a little more rum, and the long drag back to the *casa grande* and the river begins. It is one or two o'clock in the afternoon before the *trinquivales* are finally backed down to the bank of the river and the mahogany *trozas* slid into the water.

By the end of the dry season enough logs have been hauled in from the woods to make up a great raft. With the last log in, the individual *trozas* in the river are skillfully lashed into a long, narrow raft, held together by the tough vines that may have grown from their very limbs. *Caoba* is ready for its long trip to the sea.

The Mahogany Raftsman

The *peon* raftsmen, who are to take the logs to Laguna, build little huts on board and thatch them with palm leaves. Into these they move their families, chickens, always a pig or two—secured with a leather thong about its neck—and with scanty supplies of corn and beans, they set forth on their two or three months' voyage—a *peon* and his family piloting a $100,000 raft to market!

Above the rapids the unwieldy craft must be moored, carefully broken up, and, log by log, taken through to be reassembled below the falls. While this is going on, the homes and the family of the raftsmen have been transferred to dry land—only it is never dry at this season of the year.

At the mouth of the river the raft is met by a small tug which tows it across twenty-six miles of bay into Laguna harbor. Since this is [illegible]on when

(Contin[illegible])

MORRiS PUMPS

One of the 65 Thousand

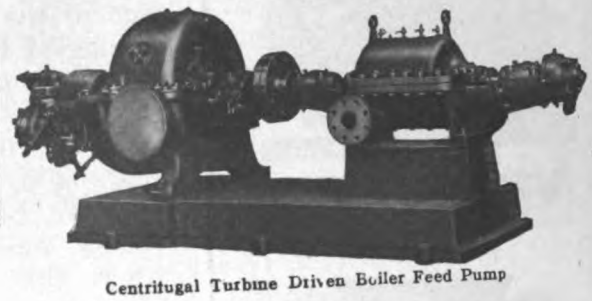
In the past 58 years we have built over 65 thousand Centrifugal Pumps of all types and sizes.

The Centrifugal Turbine Driven Boiler Feed Pump shown below, is characteristic of the type of Morris Pumps that are rendering efficient, reliable service, with the utmost economy in power plants everywhere.

The small space occupied, light weight and minimum attention required, make them far superior to reciprocating pumps for boiler feed service.

Learn details why Morris Pumps have kept the lead for 58 years, through our bulletins

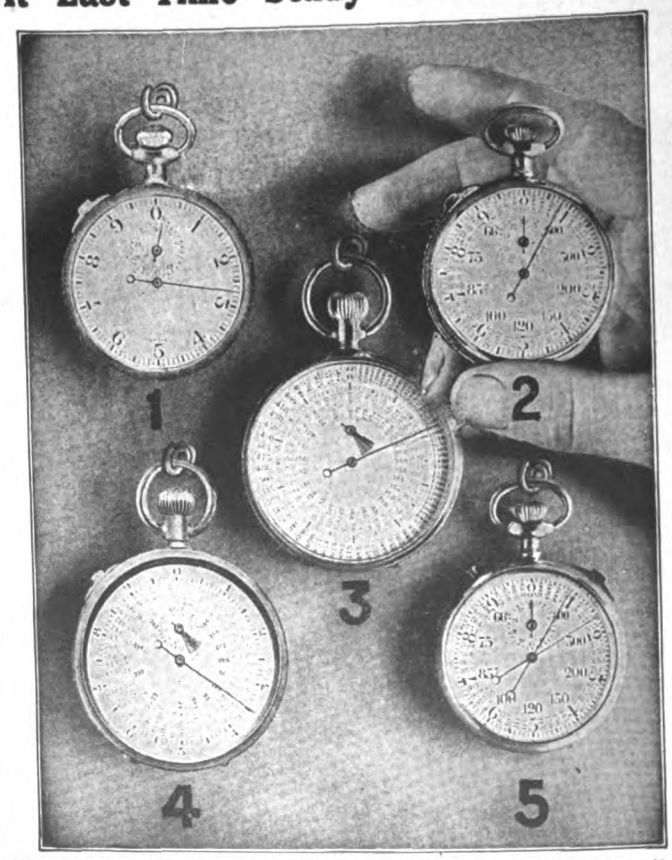
Since 1864 Builders of Dredges, Centrifugal Pumps and Steam Engines



Centrifugal Turbine Driven Boiler Feed Pump

MORRIS MACHINE WORKS
200 Genesee St., Baldwinsville, NEW YORK

At Last Time Study Watches for Every Job



At last time study watches have been developed to where they can apply to every job in the plant—do their own calculating for production figures—give you direct results with absolute accuracy. Your job may be a simple time analysis—or a complex problem in piece work rate setting or a bonus system—there's a watch in this illustration that exactly fits your needs.

For Locating Wastes Computing Costs Setting Rates for Piece Work Establishing Bonus Plans

You can use any one of these watches for every kind of time study. But each has special features that facilitate certain types of work. No. 1 has a plain decimal dial with the "take out time" feature. No. 2 has, in addition, direct readings in production per hour up to 1 minute jobs. No. 3 carries the same readings up to 5 minute jobs, in seconds and half-seconds. No. 4 gives all readings in decimals and shows production figures up to 3 minute jobs with a special arrangement for timing jobs up to 30 minutes. No. 5 is the "split hand" watch with the "take out time" improvement which now permits careful studies of multiple operations and parts of operations. Each watch has this "take out time" feature.

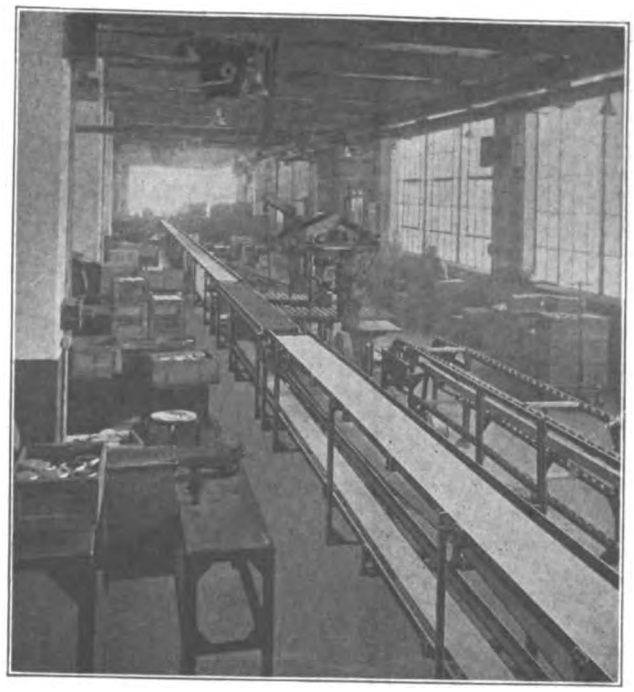
Any Watch Sent on Approval to Responsible Concerns

Pick the watch that fits your job. We will gladly send it with a descriptive pamphlet on its use to any responsible concern on approval. Put it to any test you wish—prove its advantages in facilitating the work and guaranteeing absolute accuracy. Each watch is backed by our unlimited guarantee. Write us today for the instrument that fits your requirements—or in case you desire our advice, tell us the class of work you are doing and we will ship you the watch to meet your needs. No obligation. Write today for detailed pamphlets, or for pamphlet entitled "More Jobs for the Factory Stop Watch."

MORTIMER J. SILBERBERG CO.
Peoples Gas Bldg. Pioneers in Manufacture and Sale of Time Study Watches Chicago, Illinois

Digitized by Google

Conveying System illustrated installed in American Can Co.'s Maywood, Ill., Plant



If you have material to handle Convey it and Reduce Costs

What Is the Outlook of Your Business?

If your plant is equipped with Conveying Systems you have nothing to fear because competition can be met successfully if you are producing on an economic basis.

♠ ♠ ♠

However, if you have neglected this phase of your equipment it will pay you to give it immediate consideration because the volume of your sales will be largely dependent upon your ability to produce at a cost slightly below that of your competitors.

♠ ♠ ♠

A Conveying System is decidedly more than just a lot of machinery. A Conveying System for your requirements must be designed to meet your individual conditions, hence the necessity of making a thorough survey of your plant and an analysis of your manufacturing methods so that a Conveying System can be designed which will eliminate waste motion and provide a constant flow of material to operators or packers.

♠ ♠ ♠

We will without obligating you in any manner make a consistent analysis of your material handling problem and from data secured design a system which will substantially reduce your manufacturing costs. Write us immediately advising time convenient to confer with our conveyor engineers.

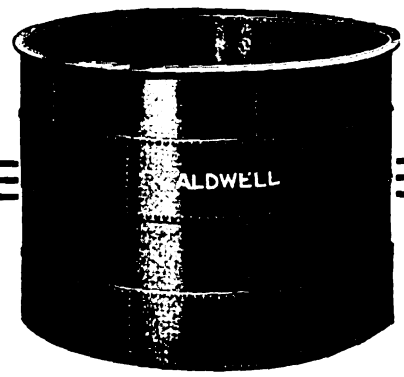
SAMUEL OLSON & COMPANY

LOOSE, BULK AND PACKED MATERIAL HANDLING SYSTEMS

2418-26 Bloomingdale Avenue
CHICAGO, ILLINOIS

Fifth Avenue Building
NEW YORK, N. Y.

Digitized by Google



We Ought to Know

We've spent over thirty years building tanks for all sorts of uses. Our engineers, designers and workmen are constantly thinking tanks. Our products are living up to their reputation in all parts of the country.

The Caldwell Steel Tank is like our other products in that it reflects all the excellence of character that such experience produces. You can rely upon it for unusual performance.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook St. Louisville, Ky.

Caldwell TANKS AND TOWERS

700 DENHAM COST SYSTEMS

have proven that, given reasonably complete usage, with approximately a normal volume of business, a Denham Costfinding and Production Record System will

Double the Profits of Users

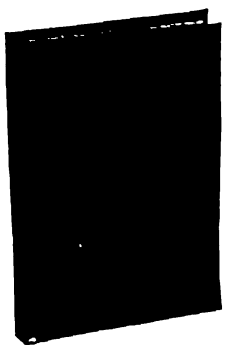
Mr. Manufacturer: How much would you be willing to invest in equipment and pay in commissions, if you could secure double your present volume of business, at normally profitable prices?

An Easier Way to Increase Profits

is to stop the hidden losses. Every dollar of loss comes out of profits. The unseen, but preventable leaks in the average well-managed business (without a Denham System) are usually more in amount than the net profits.

Denham Systems Reveal Hidden Leaks

in both the making and selling effort. Stoppage of the greater part of these, losses will easily double the profits, without increased investment, or additional expenditure of effort and money, such as would be required for doubling production.



There is no Red Tape in Denham Systems

It will pay you to investigate our service. No obligation involved.

Free Information upon Request

The A-B-C of Cost Engineering, 116-pp. cloth, will be sent *free* to any General Manager, or other factory executive upon request. State nature of business and official position. Send for it today.

Address

—THE ORIGINATORS OF COST ENGINEERING—
THE DENHAM COSTFINDING CO.
· COST ENGINEERING SERVICE ·
437 Sloan Building CLEVELAND

(Continued from Page 56)

violent "northers" may blow up without an hour's notice, the "tow" is often lost, the raft broken up, and the result of a whole year's work is frequently scattered up and down the beaches for fifty miles.

Log Pirates

Anticipating this, each log is marked with the private brand of its owner, but certain unscrupulous natives—mahogany pirates—carry on a profitable business in the recovering and remarking of these pieces of timber.

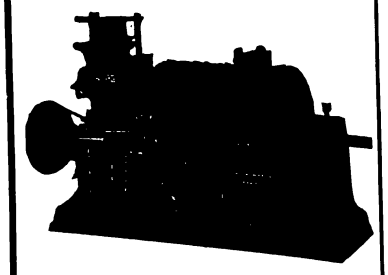
Once in Carmen and alongside ship, more hewing and cutting and then inspection by the Argus-eyed company inspector, who buys the logs always far below actual value and classifies them so that most of the first class sticks become second or third class quality. Then a chain, a winch, a few snorts of a "donkey" engine and *caoba,* King of the Tropical Woods, is stowed away in the smelly hold of a tramp steamer to be unloaded on the docks in New York or Liverpool.

A mahogany log, worth $2 on the stump, $30 in Laguna, may prove to be so highly figured that when it reaches the mill it eventually brings $2,000 to $5,000.

Solid Mahogany Houses

Solid mahognay furniture is a myth. No good mahogany furniture is "solid." The top of a desk or table is "built up," generally with layers of less valuable wood, upon which a piece of beautiful mahogany veneer, perhaps only 1/28 of an inch in thickness, is superimposed. This insures that it will not warp and gives all the beauty that "solid" mahogany could offer. Only in the home of *caoba,* down in the Great South Woods itself, is "solid" mahogany used. There houses, corrals, *cayucos,* (dug-out canoes) even fences are built of it because it is the easiest wood to saw out with their primitive board-making process. To secure a mahogany plank, a log is placed horizontally on a trestle. One man stands above the log, another on the ground beneath it and an old-fashioned crosscut saw whines its uneven way length-wise through the log, cutting out a few rough planks to be used as flooring and siding for the new *bodega.*

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY
165 Broadway New York

Digitized by Google

Tabasco Mahogany is disappearing. For a hundred years and more the wasteful lumbering process as above described has been going on. Most of the good wood within reach of navigable water has been cut out and only limited areas, far removed from transportation, remain untouched. Unless some effort is made to re-forest these jungles with this magnificent tree, "true" mahogany will only be known as it is viewed in antique furniture, while African, Philipine, Australian and other substitute mahoganies will have taken its place.

Harnessed Mountain Energy Harvesting the Mountain's Crop

(Continued from Page 11)

first test run on May 20, when a "coming out" party was staged. Since that time the flow of logs from the great forests twenty-eight miles distant by railroad, the buzz of the saws and the hum of the great motors has increased. Every cog of the plant has proved its ability to perform its portion of the work.

From trees to be finished lumber that goes into homes and factories is not such a long trail, once the machinery is in motion. But when those trees are located twenty to sixty miles distant in a rough mountain country, foresight and the judicious expenditure of a lot of money are required to complete the plant that will turn out the finished product at an expense that will leave a profit.

Realizing this fact the Hutchinson Lumber Company took advantage of those resources at hand. Agreement was reached with the Western Pacific Railroad Company whereby for eight miles logs are transported over their tracks. The Western Pacific also built two miles of the logging road, from Bidwell to Bidwell Bar. From this point the Hutchinson Lumber Company main line has now been extended into the mountains to the point where logging roads lead off into the timber.

The next move of the Company officials was to secure the cheapest possible power. This proved to be electricity, produced by the Great Western Power Company at their Las Plumas plant some fourteen miles distant from the scene of logging operations and a similar distance from the mill at Oroville. High tension transmission lines were constructed to provide the power.

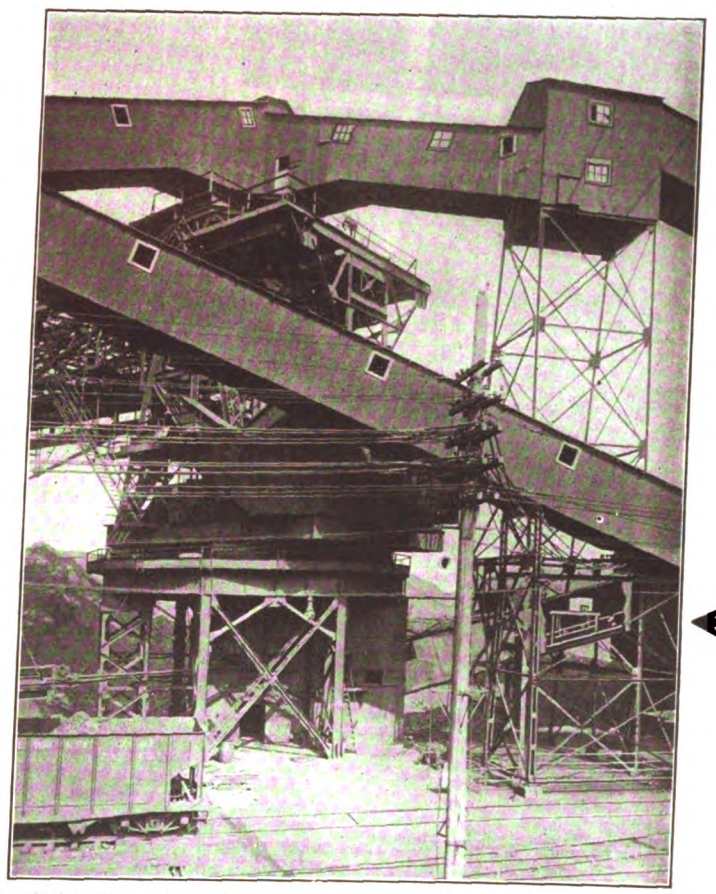
In building the logging road, that connects the Company's 40,000 acre timber holdings with their mill at Oroville, the rumble of blasting powder and the exhaust and whistle of the steam shovel awakened an area that only a short hundred years ago knew the Indians as its sole inhabitants. Its first real experience with the white men came with the gold rush in 1848 and '49, when red-shirted miners fought their way through the dense timber to reclaim the golden metal from the gravel of the waterways. A quarter of a mile distant from the present railroad of the Hutchinson Lumber Company the Indians of the old Maidu tribe still meet once a year to perform their weird ceremonial for the dead. Amid the trees that they could not use but which the white man turns to his advantage, they congregated to weep mournfully for their departed, while chanting sorrowfully and with great tears streaming down their cheeks.

A feature of the railroad is the wooden trestle spanning the South Fork of Feather River, which, by means of hinged knee-bent construction, gives a clear water span of 120 feet, supporting the stringers of the trestle on 25-foot centers. The entire railroad passes through country whose beauty is not excelled by that of any other railroad in the country. It is standard-guage, containing 75-pound rail on the light grades and 85-pound rail on the heavy grades. It has a maximum grade of 5 per cent on tangents, all curves being compensated, and has an average grade of 3 per cent. The maximum curvature is 28 degrees.

A 70-ton and a 90-ton Shay locomotive furnish the tractive power, standard Western Pa-

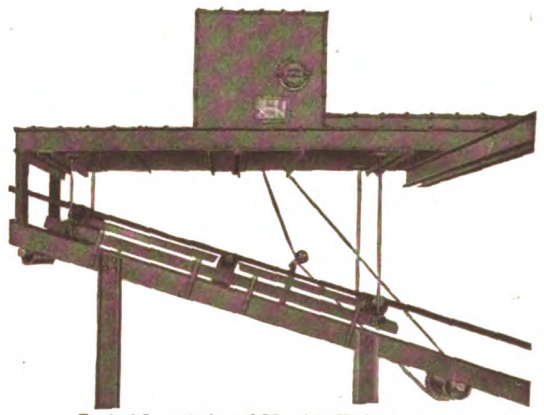
WEIGH IT WHILE MOVING

Any material handled on a conveyor fitted with **a MERRICK CONVEYOR WEIGHTOMETER** is automatically weighed as it moves along. This unique method of weighing is used by hundreds of concerns weighing all classes of material such as coal, coke, stone, ores, fertilizers, cement, clinker, copra, sand, gravel, etc. etc.



Installation of Merrick Weightometer at a prominent gas and coke company's plant

NO WEIGHMAN OR ATTENDANT REQUIRED
GUARANTEED AND PROVEN
99% ACCURATE



Typical Installation of Merrick Weightometer

For Information Write

MERRICK SCALE MFG. CO.,
180 Autumn Street **PASSAIC, N. J.**

Digitized by Google



From
Receiving to Shipping

all through the plant—in every department—Cleveland Tramrails will greatly reduce the time, labor, and cost of handling your products.

No system has ever been devised that so adequately adjusts itself to every hoisting and conveying need requiring two tons or less capacity.

It's easily installed—just like hanging a pipe line. The entire system is standardized—permitting additions whenever necessary. Corners can be turned; carriers switched from one rail to another; and elevators equipped to hoist carriers from one floor to another. It will even travel up a 12½degree incline. In fact it will go anywhere—from cellar to attic—indoors or outdoors.

There is a Cleveland Tramrail installation that will serve your individual needs.

We would prefer to analyze your plant and suggest the proper installation. May we?

Our catalogue may interest you.

CLEVELAND ELECTRIC TRAMRAIL
Division of
THE CLEVELAND CRANE & ENGINEERING CO
Wickliffe, Ohio

Sales Offices:

50 Church Street, New York City
149 E. Larned St., Detroit, Mich.
Farmers Bank Bldg., Pittsburgh, Pa.
1115 First National Bank Bldg., Chicago, Ill.

CLEVELAND
HAND OR ELECTRIC TRAMRAILS

cific flatcars being used for the transportation of the logs. These cars are all equiped with both straight and automatic air brakes and the latest improved type of logging bunks.

The forest consists of California White Pine and Sugar Pine. The largest of these trees reach a trunk diameter of from six to eight feet. To bring these great logs to the loading piles at the railroad, five electric donkeys are used. The logs are dragged to the railroad by cables. Each of these donkeys (which take the place of the old steam donkey) are operated by a 300 H. P. electric motor.

The logging equipment includes the five large electric compound-geared two-speed yarders and two electric two-speed loaders, having as auxiliary units one 30-ton American Locomotive crane for loading purposes and one 10-ton Holt tractor, and one set of Reliance high wheels for auxiliary skidding purposes. The electric yarders are of the most powerful design and have the highest line speeds of any logging machinery found on the Pacific Coast.

Arriving by rail at the mill the logs are dumped into a mill pond eight hundred feet in length by four hundred feet in width and with an average depth of eight feet. This pond is kept filled from a well, water from which is pumped by an electric motor at the rate of 1000 gallons per minute. The same well fills a 100,000 gallon tank that provides water for the extensive fire fighting system installed throughout the mill, dry sheds, planing mill, box factory and yards.

All machines in the 305 by 109 foot sawmill, with the exception of the skid lifts, log loaders and kickers, are operated by individual electric motors of general Electric make. Two 413 horse-power Sterling type boilers furnish the steam required, including that used in the dry kilns.

The timbers are sawed into lumber by three Filer and Stowell band mills including one eight foot and two nine foot mills. These mills are capable of sawing 75,000 board feet during each shift. With two shifts operating to capacity the mill will produce approximately 450,000 board feet of lumber daily.

With each machine in the mill equipped with an individual motor and with push buttons handy to each operator, the man in charge has complete control of the machine that he operates at all times.

The box factory is 80 feet wide by 197 feet long, and while not yet completed, will be modern in every detail, and will have a capacity of approximately 80,000 board feet per day.

The dry shed, which is now under construction, but not completed, will be 800 feet long by 75 feet wide and will be spanned by a traveling crane, which operates over its entire length.

The lumber which goes to the dry kiln passes over an automatic electric stacker from the green sorting shed and, after coming out of the kiln, passes over an automatic unstacker and dry sorting chain.

The green sorting shed, dry sorting shed, green storage yard, dry shed, planing mill and box factory are all connected by a mono-rail system.

Probably more spectacular than any other portion of the operations, with the exception of the electric logging donkeys, is the electric mono-rail system. From the 540 foot green sorting shed the lumber is arranged in stacks beneath the track on which the overhead, electrically operated mono-rail car runs. The mono-rail operator brings his car to a stop above the stack of lumber. Two sets of great fingers are dropped and hooked beneath the stack of lumber, raised about twenty-five to forty feet in air and the entire stack of lumber is carried bodily to its location in the yards.

A transfer switch in the mono-rail system permits the mono-rail operator to carry his stack of lumber to any desired location in the yards. Arriving in the yards, the great fingers, with their load of lumber, are dropped down, unhooked, and the lumber is in place. The same system is used in loading the lumber on to cars for shipment.

In all of the operations at the mill site the plant is so constructed and arranged that only three men will need to work without a roof to protect them from summer sun or winter rain.

Digitized by Google

—lower costs

—reduced wastage

—larger output per man

—more intelligent teamwork

—improved relations with the working force

—more cordial support of managerial policies and plans

THE above are some of the results actually achieved in over 500 progressive companies through a properly conducted program of Foremen Training.

All are factors that quickly make themselves felt in profit and loss statements.

The foremen are the key men in your organization. Give them a chance to help you effectively in building up profits.

During the past four years, the Business Training Corporation has conducted not less than 80 per cent of all the training for foremen carried on in the United States. This record is in itself a sufficient guarantee that our training course in Modern Production Methods is sound and practical. It appeals strongly to the foremen themselves. The meetings are conducted by members of an experienced lecture staff. The expense is moderate.

To any plant manager or other executive officer we will gladly send on request a descriptive booklet called "Making Better Foremen." It will bring you worth while suggestions for strengthening the stability and profits of your business. Write for your copy—sent without charge or obligation—today.

Business Training Corporation

185 Madison Avenue **New York City**

Digitized by Google

GRAPHICS WILL TELL

This check list of supplies will help you

EDEXCO GRAPHIC RECORD SUPPLIES

EDEXCO MAP MARKERS

COLORED MAP PINS
NUMBERED MAP PINS
CELLULOID TACKS
MAP RINGS
MAP CORD
GLASS BEADS
GUMMED SYMBOLS
SIGNAL FLAGS
CARD SIGNALS

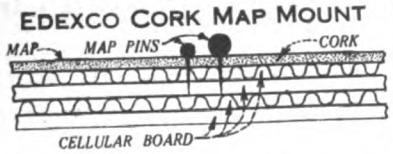


EDEXCO OUTLINE MAPS

STATES
UNITED STATES
COUNTIES, R. R.'S, CITIES OF 25M
WORLD

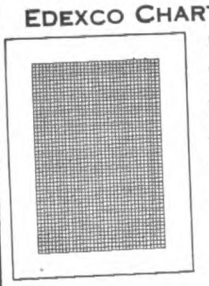


EDEXCO CORK MAP MOUNT



SWINGING LEAF FIXTURES

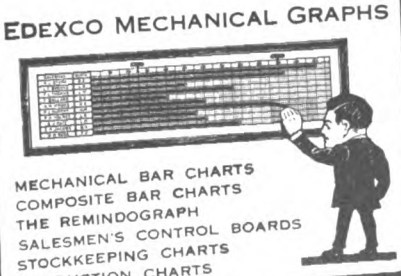
EDEXCO CHARTING PAPERS



LARGE SIZE
LETTER SHEET SIZE
LOGARITHMIC
ARITHILOG, SEMI-LOG
YEARBYDAYS
BARGRAPH
POCKET SIZE
COLORED CRAYONS

BOOKS ON GRAPHICS

EDEXCO MECHANICAL GRAPHS



MECHANICAL BAR CHARTS
COMPOSITE BAR CHARTS
THE REMINDOGRAPH
SALESMEN'S CONTROL BOARDS
STOCKKEEPING CHARTS
PRODUCTION CHARTS

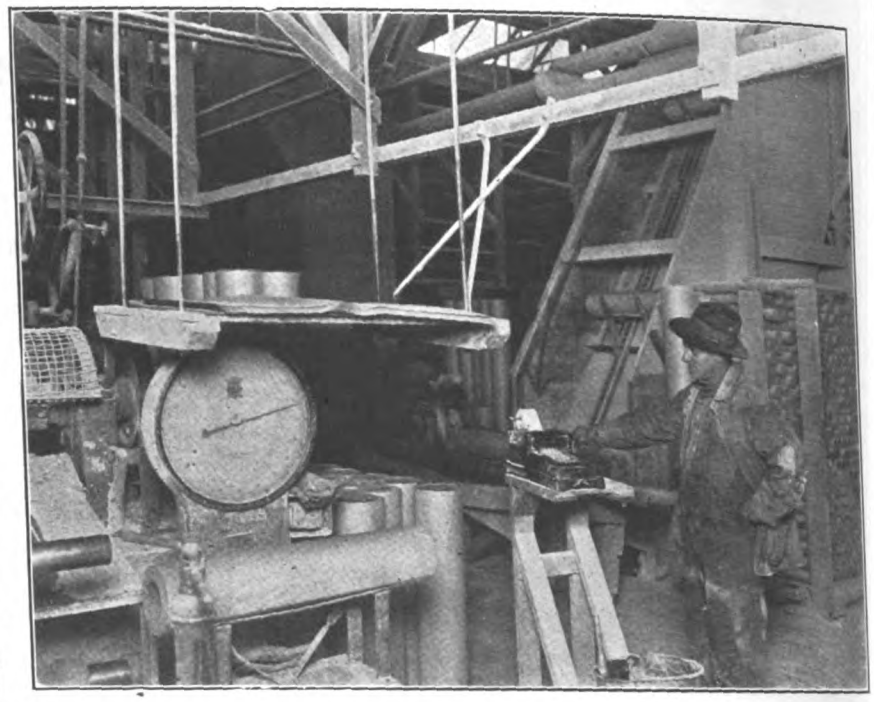
EDUCATIONAL EXHIBITION COMPANY
327 CUSTOM HOUSE ST., PROVIDENCE, R. I.

Send me details on items checked above.

Name..... Title.....
Firm..... St. & No. .....
City..... State.....

Also here is $1.00 for the
EXPERIMENTAL SET
map pins, charting papers, map mount, EDEXCO Primer [illegible] and both catalogs.
Get this set and see how graphics might fit your [illegible]

Large Rolls of Paper Transported by One-Man Crane



THE accompanying illustration shows a one-man crane of special design employed in handling large rolls of paper and felt to and from the storage warehouse of the Paraffine Companies Inc., of San Francisco.

The crane runs on a series of I beams bolted to the roof trusses, thereby enabling the operator to deposit or pick up a roll at any point in the warehouse.

Two tracks extend across the end of the warehouse, over which a second crane operates; by means of which the one-man crane can be transferred from one I beam to another. Both cranes are controlled by the operator, who rides on a seat attached to the crane that picks up the rolls. The crane is provided with a pair of heavy jaws which engage the core of the roll as shown in the photo. These jaws are opened and closed by jaws are opened and the operator's right hand. As soon as the crane operator lowers a roll to the floor, he releases the jaws from the core by manipulating this lever.



The telephone system illustrated above is in use in several large automobile factories. It differs from other intercommunicating systems in that depressing of the key establishes the circuit without requiring action at the other end. The man called does not have to stop work in order to answer.

Digitized by Google

"The Foreman is the most vital link in Production"—A leading official of the DuPont Co.

Attack Production Costs Thru Your Foremen

The Foreman is the man who has to handle the *human element* in production—that most sensitive and difficult of all industrial elements. Upon his ability to handle men depends the loyalty and efficiency of the workers. If the Foreman is properly trained in leadership he can inspire the men in the ranks with enthusiasm and loyalty.

In addition to dealing directly with Labor, the average Foreman, if he is to keep pace with the requirements of his position, has to do an amount of work and discharge a volume of responsibilities big enough to demand the best energies of a really able man. If the Foreman knows his business as he should, if he is intelligently trained in the handling of jobs and in planning and production, he can accomplish more in efficient and economic production than any other man in the plant.

Industry is just awakening to the need of better Formanship and production methods. Speaking of this, a high and able official of the DuPont Company says:

"Management is almost universally to blame for the fact that it has not shown the foreman himself how big his job is. As most foremen are picked workers who have been promoted from the ranks, it is natural that they should be unfamiliar with many of the executive problems with which they must deal in their supervisory capacity. This is the big task of today—to supply that education."

Train Your Foremen Under LaSalle's Group Plan

LaSalle Extension University has organized the brains and experience of hundreds of industrial experts and thousands of Foremen into a practical plan of training in "Modern Foremanship and Production Methods." In fact, no less than five thousand Foremen have contributed their experience to this training. They have joined with experts and specialists to give American industry and its Foremen the result of years of study and practical shop experience. The result is a "practical-experience" course covering thoroly all phases of Formanship such as Handling Men; Developing Morale; Handling Jobs; Planning and Production; Cost Control in the Shop; Routing; Scheduling; Inspection, etc.

Mr. Hugo Diemer, M. E. In Charge

Mr. Hugo Diemer is the director in chief of this training. He has been engaged by the University to give his entire time to the direction of this work. During his career Mr. Diemer has had charge of production at the Goodman Manufacturing Co., Chicago, has been superintendent of the National Motor Vehicle Company of Indianapolis, and Head of the Industrial Engineering Department, Pennsylvania State College. During the war he was Commanding Officer at the U. S. Cartridge Company of Lowell and on the staff of the Commanding Officer at the Bethlehem Steel Works. For a year and a half he also was Personnel Superintendent of the Winchester Repeating Arms Company.

Associated with Mr. Diemer are Messrs. Meyer and Daniel Bloomfield, the noted authorities on industrial relations. Mr. Meyer Bloomfield was formerly director of the Harvard University Vocational Bureau, head of the Industrial Service Department of the U. S. Shipping Board Emergency Fleet Corporation, and Special Commissioner to Porto Rico for the War Department.

The LaSalle Foremanship Council



HUGO DIEMER, Director

Leroy Tabor, Tabor Manufacturing Co., Philadelphia, Pa.
George R. Townsend, Manager, International Steel and Ordnance Co., Lowell, Mass.
Richard A. Feiss, Manager, Cloth Craft Shops, Cleveland.
J. M. Carmody, Production Manager, H. B. Black Company, Cleveland, Ohio.
Matthew Porosky, Chairman, Factory Management Committee, the Holtzer-Cabot Electric Company, Boston.
S. Babcock, General Foreman, Power Plant, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.
Boris Emmet, Labor Manager, Henry Sonneborn and Company, Inc., Baltimore, Md.
Allen B. Crow, Secretary, Society of Industrial Engineers, Detroit, Mich.
F. C. Shafer, Factory Manager, Penberthy Injector Company, Detroit, Mich.
James L. Ackerson, Second Vice President, Merchants Ship Building Corporation, Philadelphia, Pa.
William Bethke, Educational Director, LaSalle Extension University.
E. F. Dahm, Associate Director of Education, LaSalle Extension University.
Meyer Bloomfield, Editor-in-Chief, Modern Foremanship Course.
Daniel Bloomfield, Associate Editor, Modern Foremanship Course.

The LaSalle Problem Method

There is no better way to learn than by actually doing. That is the basic principle of the LaSalle Problem Method used thruout our company--group training plan. The members are not only brot in contact with real problems of foremanship and production within the plant, but are shown how to apply principles and plant practice to their solution. The LaSalle group plan of foremanship training is a quick and effective way of increasing production, getting better coordination of effort, building loyalty and morale in the organization, and of making effective policies of the management.

LaSalle training in Modern Foremanship and production Methods affords an opportunity for the management of any industry to secure, under able and efficient supervision, group training within the plant for the foremen, shop executives—the men supervising production.

Increased production of 20% per man thru proper training and leadership on the part of the foremen has not been difficult of accomplishment. How much of a saving would such a result alone mean in your monthly payroll?

We invite inquiry from plant officials, production managers and executives. Let us explain to you in detail just how the LaSalle Company-Group plan of training in Modern Foremanship and Production methods can be installed in your plant. In making request for further information you place yourself under no obligation. Use the coupon—mail it now.

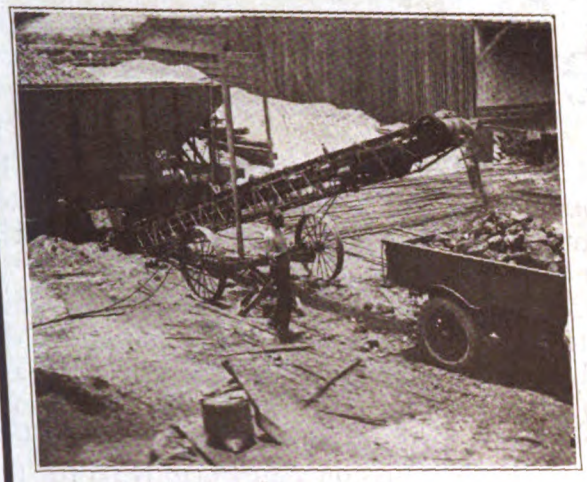
LASALLE EXTENSION UNIVERSITY
The Largest Business Training Institution in the World
Dept. 9307-F. Chicago, Illinois

Please send me a catalog and full information regarding the LaSalle Company-Group Plan of Training in Modern Foremanship and Production Methods. This information is to be sent free and without obligation.

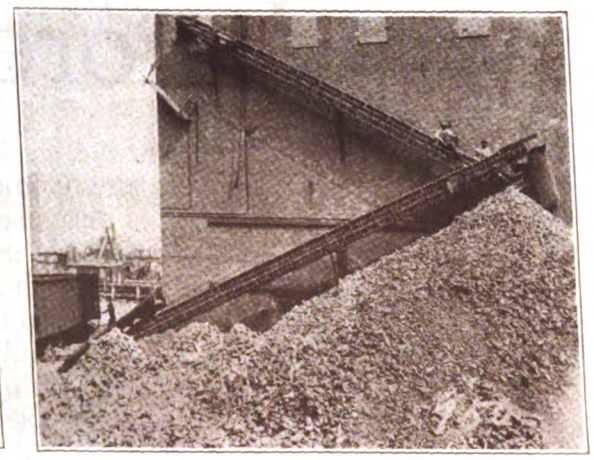
Name .....
Position .....
Company .....
Address .....

Digitized by Google

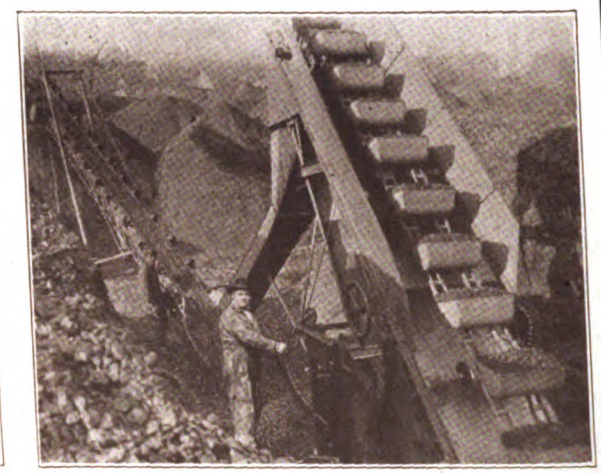
DO YOU NEED CONVEYOR HELP?
—To Replace the "Floating Gang"



1. For speed in unloading cars with or without track hopper. Tampa Coal Co., Tampa, Fla.



2. Unloading cars and piling to storage inside or outside with B-G conveyors. General Carbonic Co. New York City



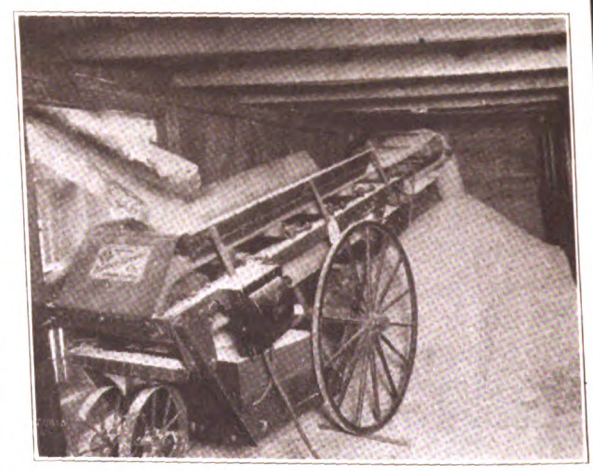
3. Piling back from a railroad trestle with B-G loader and conveyor. Unload cars by dumping. Western United Gas & Electric Co., Aurora, Ill.



4. Coal Conveyor converted into a moving inspection table by the National Acme Co., Cleveland, O.



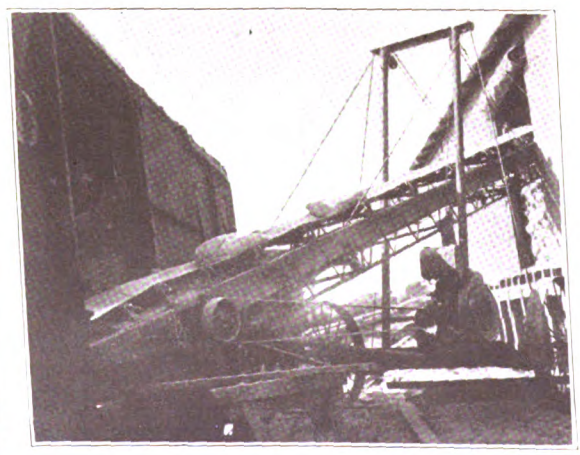
5. Breakage eliminated, loading speeded up by a B-G conveyor Morey Clay Products Co. Ottumwa, Ia



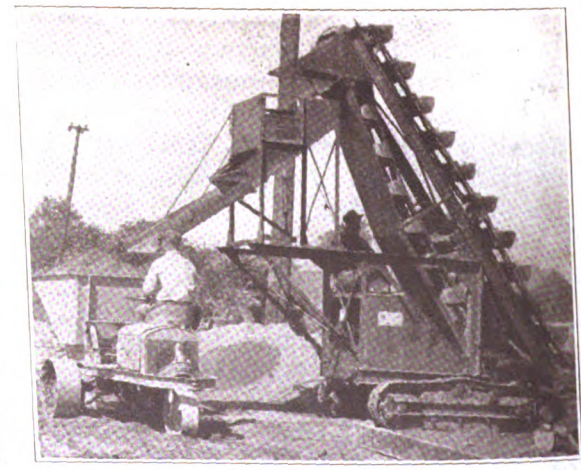
6. Especially designed conveyor for loading box cars. Bevis Rock Salt Co., Kansas City, Mo.



7. Faster than a magnet unloading cubes of scrap. Wilkoff Scrap Co., Youngstown, O



8. All wheeling eliminated and stacking made easier with a B-G conveyor. White Construction Co., Chicago., Ill.



9. Industrial cars, tructractors, etc., can be loaded quickly as shown. Liberty Engineering Co., Chicago, Ill.

Tear out this cornerand mail

Barber-Greene Company, Aurora, Ill., U. S. A.

I am interested in a handling problem similar to No..... Please send more information. No obligation.

Name..... Position.....

Company .....

Street.....

City.....

State .....

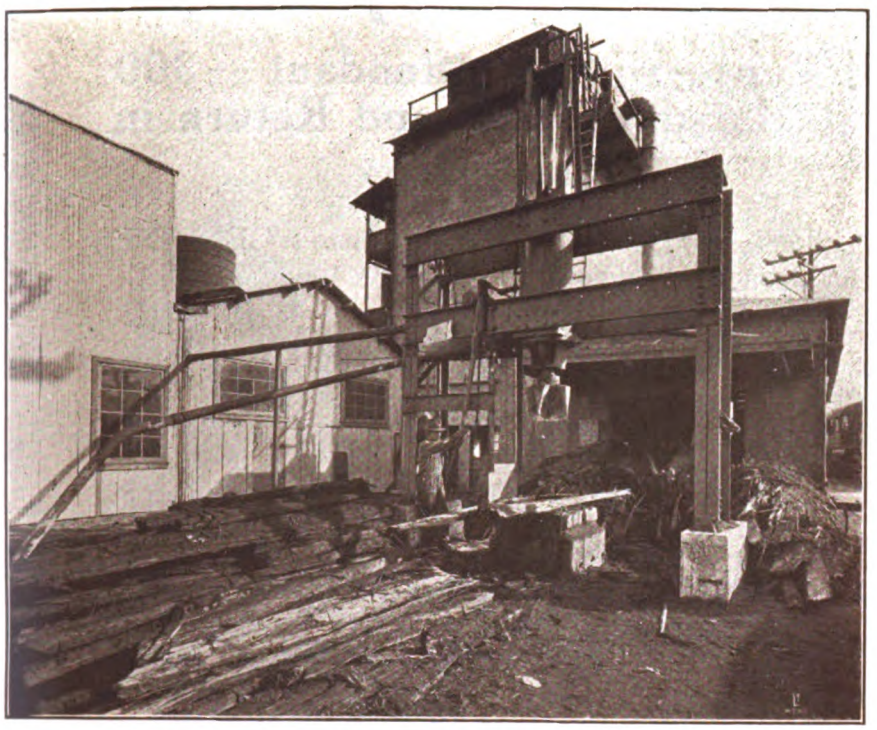
Barber-Greene Company

470 W. Park Avenue, Aurora, Illinois

Branches in most Principal Cities

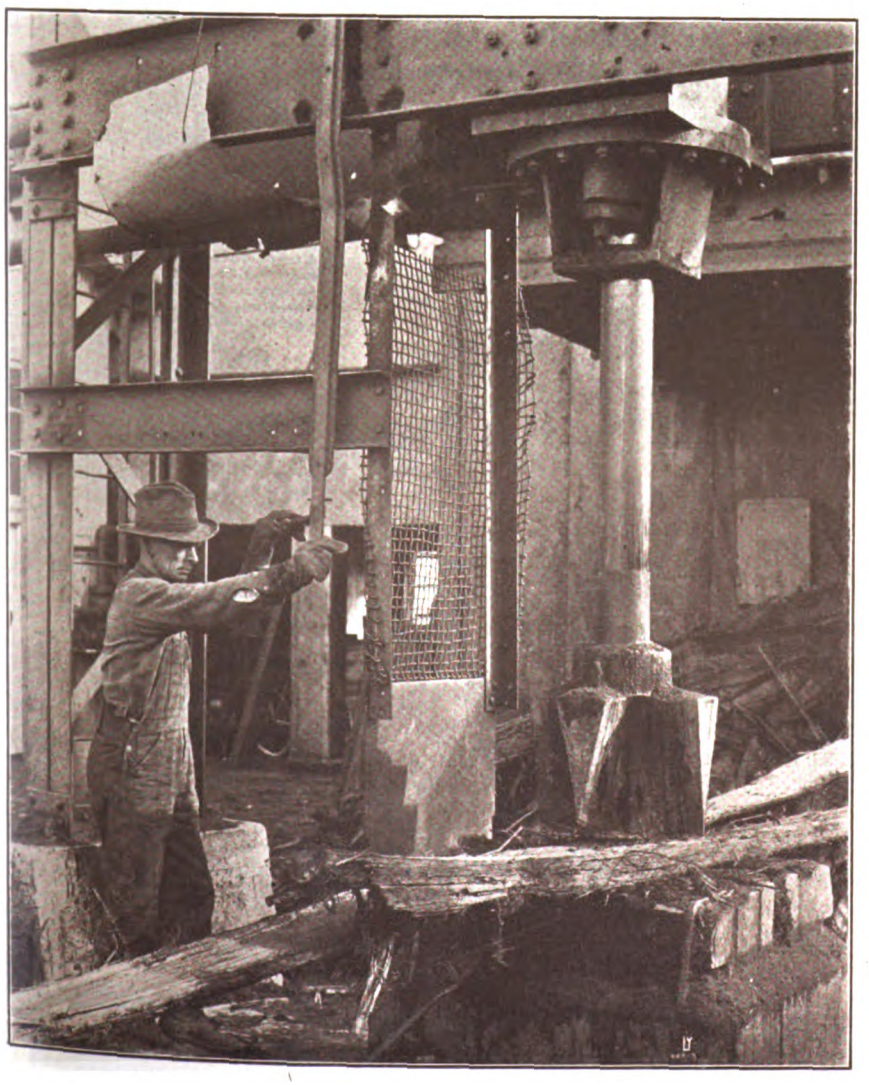
Digitized by Google

Specially Designed Steam Operated Ax Cuts Up Red Wood Bark

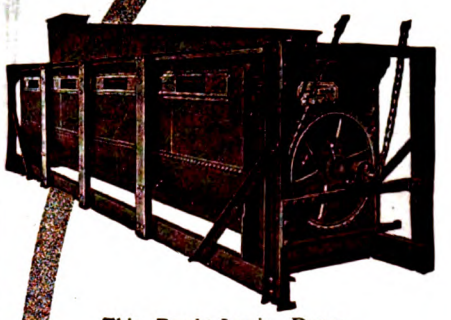


REDWOOD bark is so tough that it cannot be cut up by a saw and as a result the Paraffine Companies Inc. of San Francisco have designed a special steam operated ax, which chops the bark up so that it can be shreaded for use in manufacturing purposes.

This steam operated ax has done away with a crew of men who formerly were employed in chopping the bark up by hand axes. It takes but a few blows of this power chopper to equal the work of a hand ax for an entire day, and the resulting product is in better shape for shredding.



Solving Your Drying Problem



This Brecht-Lewis Dryer turns out greater volume—faster, better and cheaper.

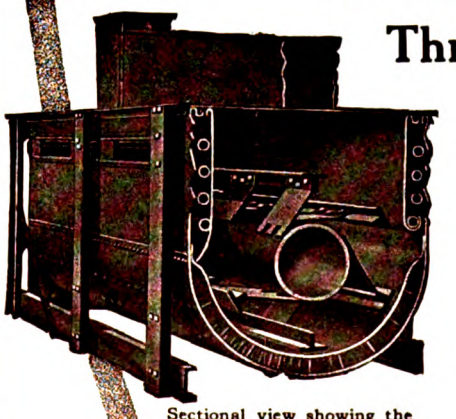
MANY drying problems vanish with the installation of a Brecht-Lewis Dryer. Greater volume, more perfectly dried product, and with lower steam consumption and H.P. used—that is the remarkable accomplishment of this new departure in dryers which can be operated either as a batch or continuous dryer at a saving over other systems.

BRECHT-LEWIS DRYER

(PATENTED)

The Brecht-Lewis Dryer opens a new era of economy in the drying of all materials of a loose, shredded or granular nature. Successfully handles:—

Apple Pomace
Alfalfa Meal
Beet Pulp
Bagasse
Bone
Carbonates of Lime, Potash or Soda
Cereal Products
Chalk
Charcoal
Clays
Coal
Coffee
Copra
Cork Chips
Cotton Seed Meal
Fish Scrap
Garbage
Grains
Graphite
Gravel
Gypsum
Kaolin
Leather Scrap
Lime
Marl
Metal Chips
Nitrate of Ammonia
Nitrate of Potash
Packing House Products
Peanut Hulls
Peat
Phosphate
Pumice Stone
Rice
Salt
Sand
Sawdust
Silica
Soapstone
Sugar Refuse
Talc Rock
Tobacco Stems
Whiting, and many other materials



Sectional view showing the improved method of heating and agitating—the secret of this dryer's efficiency.

Three Dryers In One!

This new design is really three Dryers in one; a combination of direct and indirect heat dryer allowing heat control from three sources—

1. From the steam drum,
2. From the jacketed bottom,
3. Hot air forced in from the side coils,

and is therefore adaptable to materials requiring either high or very low temperatures.

Hot air under pressure carries away the released moisture without re-condensation.

Write for FACTS!

THE BRECHT COMPANY
1219 Cass Ave. St. Louis, Mo.

Branches:
New York, N. Y.
Chicago, Ill.
San Francisco, Cal.
Liverpool, Eng.
London, Eng.
Cape Town, S. A.
Buenos Aires, A. R.
Madrid, Spain
Shanghai, China
Mexico City, Mex.
Sidney, N. S. W.

The Brecht Company,
1219 Cass Ave., St. Louis, Mo.

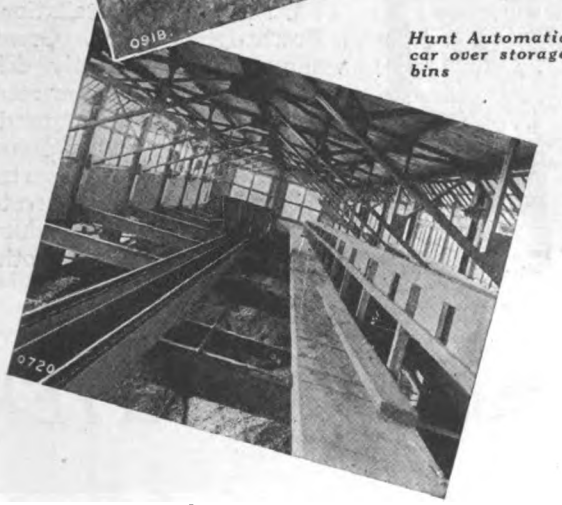
Please tell me, without obligation on my part, how the Brecht-Lewis Dryer is adapted to my business, and how it will effect economies for me.

Quantity of material to be dried daily .....
Percentage of moisture in mixture .....
Percentage of moisture to be removed .....
Firm Name ..... Address .....
Attention of ..... Title .....

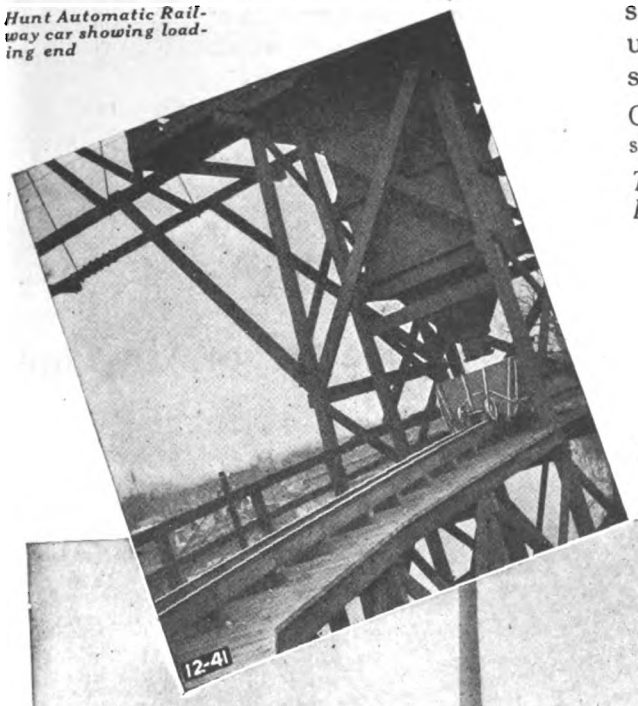
Digitized by Google



Hunt Automatic Railway car dumping load in yard



Hunt Automatic car over storage bins



Hunt Automatic Railway car showing loading end

How's This for Speed?

This Car will Run — without attendant — 300 feet, Dump its Load of Coal and Return in 50 Seconds.

Quick work you must admit! But that isn't all—there's GENUINE ECONOMY wherever this system is used— and Safety too.

HUNT AUTOMATIC RAILWAY

Absolutely self-acting from time of starting with load, until it returns empty and ready for another load.

The cost of operating is confined to *one* man's wages. The workman at the loading end fills car and starts it down track,—but does not accompany it—it automatically dumps the load at any desired point and returns under action of gravity.

Coal can be accurately weighed without delay or extra expense, by placing platfom scales at loading end, (in the tracks). The loader weighs the car and while car is running down the tracks, enters the weight in the tally book.

Track and supports can be easily erected; the whole system is free from any confusion of switches, turnouts, ropes, etc. No loose pieces to get stolen or lost; nothing to take care of or put away. Cars left just as used and are ready for work at any time. Good for at least 10 years service without repairs—(We have records of 30 and 40 years).

Can also be used for transporting sand, phosphate rock, clay, ores, limestone, salt, cement and similar bulk materials from railroad cars and vessels to storage bins or pockets.

The Efficiency, Economy and Safety of the Hunt Automatic Railway is fully described in Booklet 20-3.

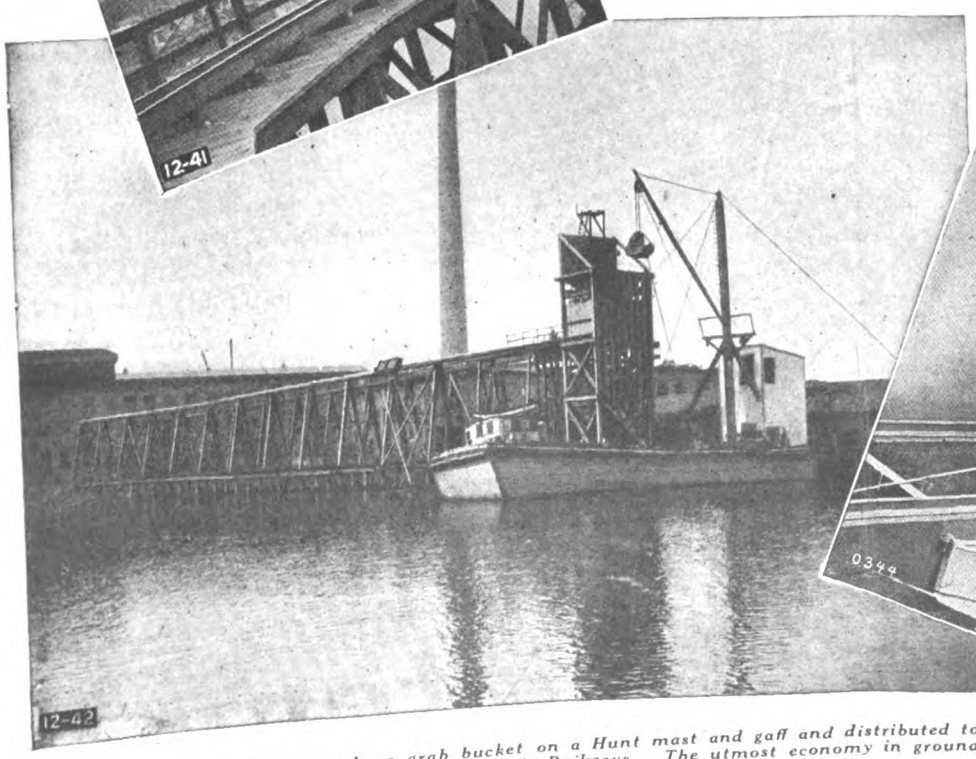
C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, NEW YORK

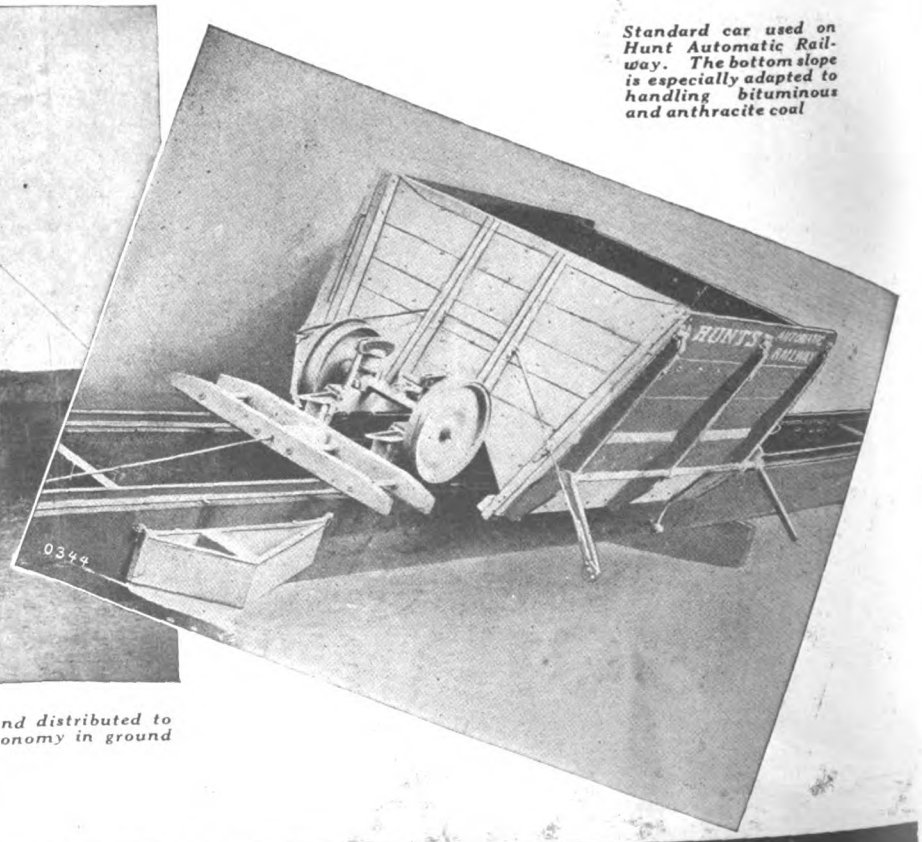
New York Office, 143 Liberty Street

Ernest F. Learned
141 Milk St., Boston 9, Mass.

Philips, Long & Co., Inc.
538 So. Dearborn St., Chicago, Ill.



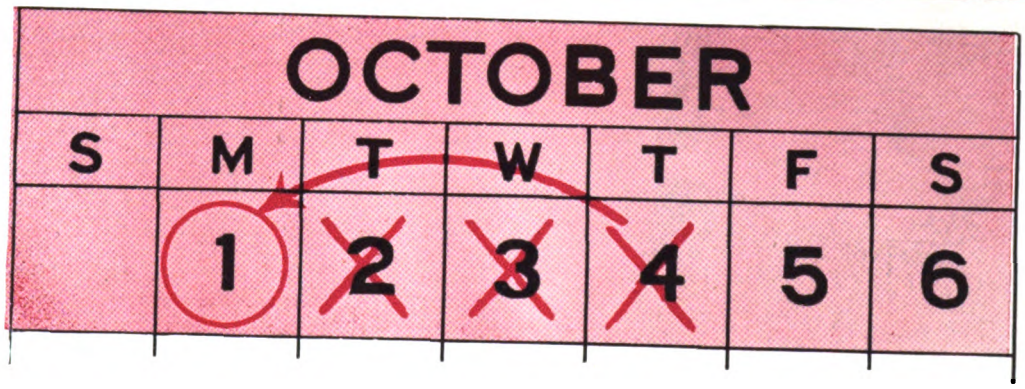
Coal received by water, is hoisted by a grab bucket on a Hunt mast and gaff and distributed to storage under the trestles of Two Hunt Automatic Railways. The utmost economy in ground space is thus secured



Standard car used on Hunt Automatic Railway. The bottom slope is especially adapted to handling bituminous and anthracite coal

Digitized by Google





Advancing Shipping Dates from *Thursday* to *Monday*

ORDERS for Boyce Moto-Meters which once required four days to fill are now completed in less than a day. Installation of a Lamson Conveying System to speed up assembly caused the almost unbelievable increase in capacity.

As a result, stocks of meters formerly needed to insure quick delivery have been decreased by 100,000 instruments. Capital tied up in these stocks has been released for productive purposes.

Lamson Conveyors are rapid, economical and flexible. They put assembly on the same automatic machine basis as the manufacture of the separate parts. They act as the peacemakers by which you are able to control output at will.

A conveying system is a profitable investment where light units such as motor-meters and radio instrument parts are put together. But it brings the same economies to the assembly of units such as automobiles and furniture.

Perhaps a conveying system in your factory or mill would increase production and cut your labor and overhead costs. Send for one of our representatives. Let him tell you if a Lamson Conveying System should be installed. Write to

LAMSON SERVICE

THE LAMSON COMPANY
100 BOYLSTON ST., BOSTON, MASS.
Branches Everywhere

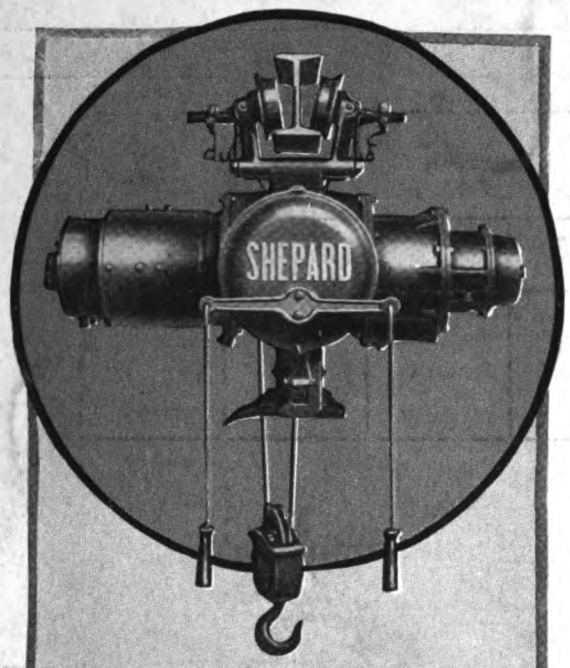
Lamson Conveying Systems

Digitized by Google

THE SHEPARD ELECTRIC LIFTABOUT

A new and smaller Electric Hoist

Judge the *economies possible for you* by the economies others enjoy



You will find that a LIFTABOUT is lower in price than you may think a good hoist would cost.

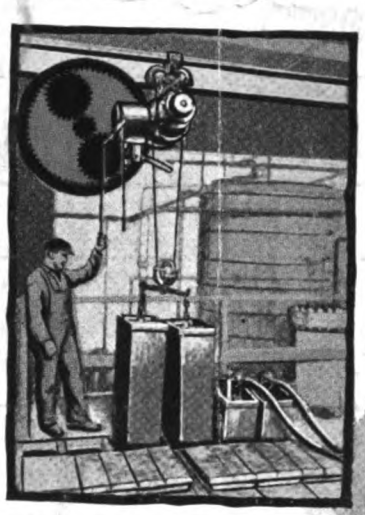
Standardized manufacture, quantity production, and made by America's largest producer of electric hoists.

Business executives, engineers, superintendents—

send for this bulletin—your first step toward low cost load-moving and lifting.



Hundreds of industries and businesses, handling material of all kinds, are finding in the *LiftAbout*, the long sought load-moving and lifting economies. The three mentioned below are typical. There are many, many more.



"Needs only one man"

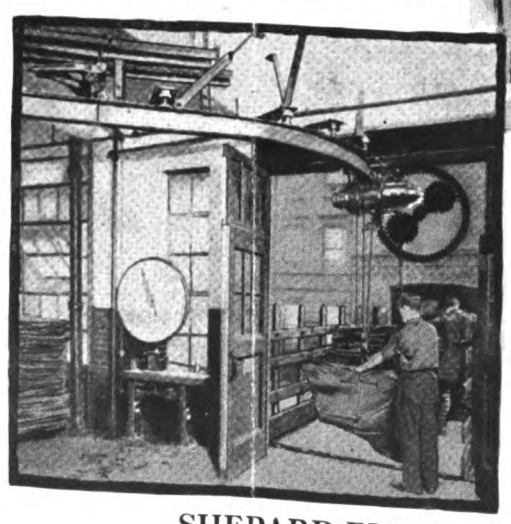
"Besides, the *LiftAbout* is used for loading and unloading trucks; and while simplifying and systematizing this work, it has speeded it up. It needs only one man."

—Leo Brand, M. Brand & Son, New York City, manufacturer of butcher's supplies and sausage casings.

"50% quicker, and returns its cost every 4 1-2 months"

"The Shepard *LiftAbout* is also easier to operate; it is at least 50% speedier; the men like it better, for it can be operated with one hand; and it has automatic stop that really works. Our *LiftAbout* has returned its cost at least twice in the nine months we have had it, for we have never suffered any losses on ice we couldn't pull."

—David Cochran, Chief Engineer, E. H. Schmidt Hygiene Ice Company, West New York, N. J.



"A yearly saving of $2500"

"One man does the work of four. As all of the material we handle is bulky stuff, the Shepard *LiftAbout* is especially valuable, for bulkiness means nothing to this equipment, whereas handling by hand is very bothersome, due to bulkiness as well as the weight."

—J. H. Lang, President, Fried-Lang Leather Co. New York City

Write us about low cost load-moving for any business.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 SCHUYLER AVENUE, MONTOUR FALLS, N. Y.
Branches in Principal Cities
Member Electric Hoist Manufacturers' Association

REG. U.S. PAT. OFF.

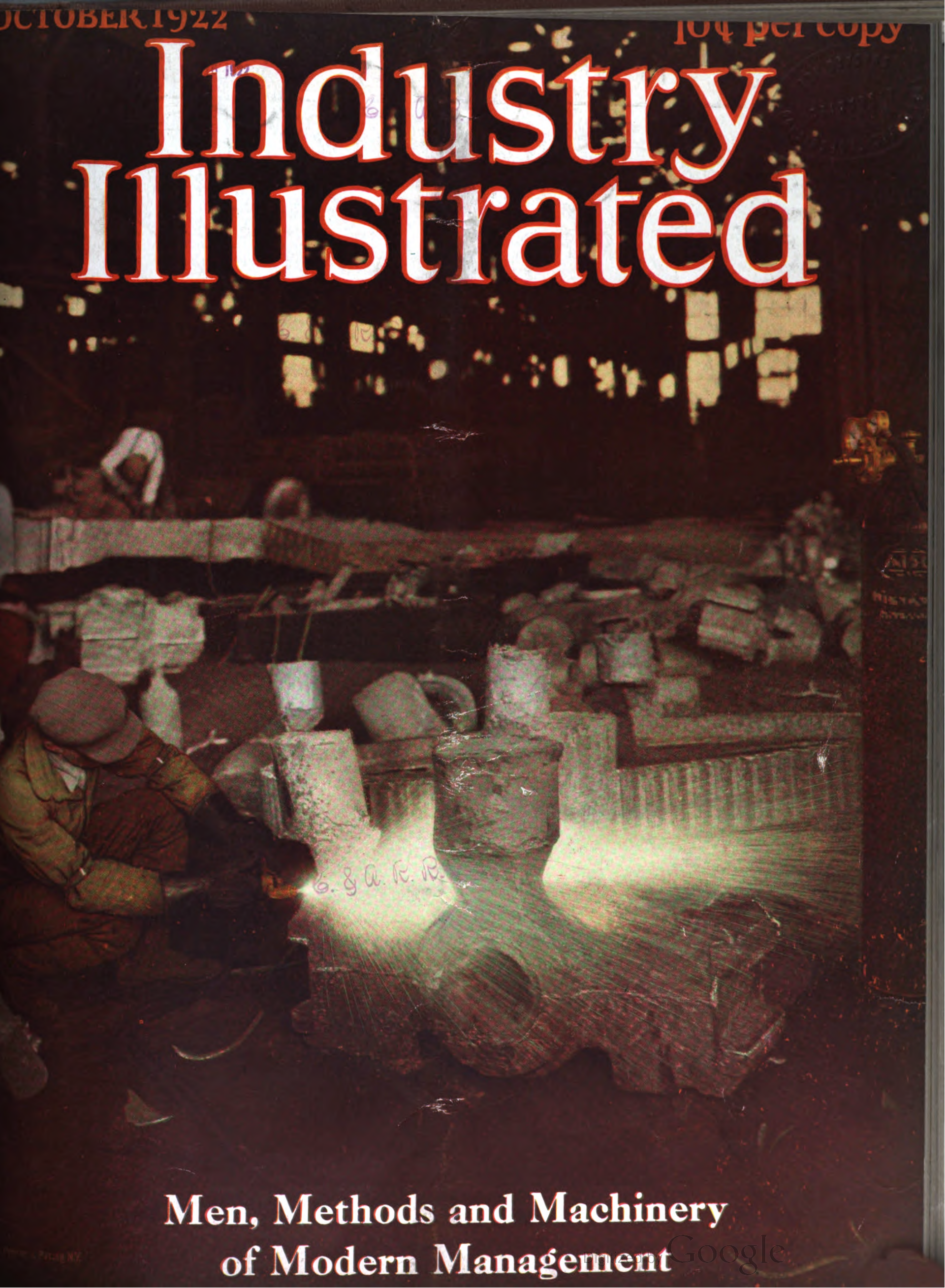
SHEPARD
ELECTRIC CRANES & HOISTS

Digitized by Google

OCTOBER 1922

10¢ per copy

Industry Illustrated



Men, Methods and Machinery of Modern Management

Digitized by Google



A Mercury tractor and a train of Hyatt roller bearing equipped Mercury trailers working in the plant of the Cudahy Packing Company, Cudahy, Wis., transferring pork sides.

Trailers That Successfully Resist Wear

The economies of maximum loads per trailer and maximum trailers per train can only properly be secured when sturdy, easy running trailers are used.

The uninterrupted carrying of heavy loads requires trailers that are well built of good materials. Hyatt bearings, with their sturdy steel rollers, are important parts of dependable trailers because they stand up under the heaviest loads throughout years of service.

A tractor can pull twice as many Hyatt equipped trailers as plain bearing trailers because Hyatt bearings provide a true rolling motion in place of the sticking, rubbing friction of plain bearings.

Specify that your new trailers be Hyatt equipped or apply Hyatt replacement wheels to your present trailers, and learn the economies of maximum loads per train.

Hyatt Roller Bearing Co. Industrial Bearings Division **New York, N. Y.**

Motor Bearings Division, Detroit
Tractor Bearings Division, Chicago

USE HYATT BEARINGS ON YOUR LINE SHAFTS TOO BULLETIN 127

Pacific Coast Division
San Francisco

Digitized by Google

INDUSTRY ILLUSTRATED

CONTENTS

October, 1922

Editorial—Today's Cost Cutting Tools Page 7

What Ford is Doing and How He Does It 8
By John H. Van Deventer.

What Suggestion Systems Have Accomplished 14
By Appleton Street—Some Worthwhile Ideas Developed by the Rank and File.

Oil, as a Fuel for Steam Power Generation 16
By W. Thomson Lees.

Oblique Methods Bring Orders 19
By Kathryn Murdock—The Value of Displays that Do Not Attempt to Sell.

The Modern Telegraph—Its Methods and Operations 20
By H. W. Rustin.

The Making of Watch Crystals Now an American Art 25
By W. H. Holmes.

Music as an Aid to Industrial Teamwork 26
By B. S. Beach.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.,

Founded 1891 by

JOHN R. DUNLAP
Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — WALTER IVES, *Vice-president* — RUTLEDGE BERMINGHAM, *Vice-President* — JOHN R. DUNLAP, JR., *Secretary-Treasurer*

Vol. 3, No. 4. Subscription price $1.00 per year; single copies 10 cents.

Copyright, 1922, by The Engineering Magazine Co., in both the United States and Great Britian.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google

COST REPORT SERIES 4

Presenting certified figures on the operating costs of B-G. Machines.

No part of this report written, altered or even seen by Barber-Greene.

Finished report as quoted here is only report which was delivered to us.

Conveyors Save $1672% Yearly



AT the plant of the General Carbonic Company, Long Island City, New York, 2 men and the Barber-Greene conveyors shown do work in 21-3 hours which formerly took 5 men 1 1-2 days.

The savings in handling costs amounts to $1672.00 a year and at the same time the "floating gang" has been eliminated.

Mr. F. W. Harper, superintendent, reports as follows:

"Our series of 3 B-G conveyors handle coke at a cost of $5.68 a day. This represents a saving of $1672.00 a year over the cost of handling and storing the material in our yard by hand.

"*We have a 1200 ton storage bin which it would be impossible to use without some kind of conveyors for loading it* and the small tonnage handled would make pivoted-bucket carriers too expensive. The alternate method would be to store our coke in the yard. This is what we used to do, and originally handled all the material by hand."

Exact cost figures on this job are given in a report prepared for us by the H. P. Gould Company, industrial auditors. Mr. Harper has certified these figures. It is easy to send the coupon. Tear it out and send it today.

B STANDARDIZED MATERIAL-HANDLING MACHINES G

BARBER-GREENE COMPANY
470 W. Park Avenue, Aurora, Illinois

Please send Cost Report No. ____ I am interested in handling ____

Name ____

Company ____ Position ____

Street ____

City ____

State ____

I I
O

Barber-Greene Company

470 W · PARK AVE. AURORA, ILLINOIS

Branches in Most Principal Cities

Digitized by Google

A Message to Executives

HOW much would you be willing to pay for an organization of men who have been specially trained for production work?

YOU have the men—We have the method—and it does not involve a single dollar of expense on your part.

Your problem is to get volume of production at low cost. To get volume you must get standard quality, and uniform operation. For certainly every sale starts in the plant. If your methods of purchasing, handling materials, planning and scheduling production, laying out equipment, generating and distributing power, controlling labor, and establishing costs are not sound, then your sales department cannot function successfully in the face of intelligent competition.

Economical production is possible only if the key men and department heads in your organization are equipped to get close to 100% effectiveness out of your material equipment, and out of the men they supervise. But the key men usually know only those things about production work which they have learned by personal experience in one or possibly two departments, and in just one branch of manufacturing.

Give to them a comprehensive knowledge of methods and principles which have been successfully established in many other plants, and in other branches of manufacturing, plus a perspective of the activities of all departments in a modern industrial organization and they will constitute a more dependable, a more intelligently working organization. They will direct the men under them more effectively and they will help you directly to solve those problems which are arising every day in your plant.

The Industrial Extension Institute has been co-operating with many industrial organizations by training their men through the Factory Management Course and Service.

This is a thoroly practical course in industrial engineering and management, prepared by more than 100 industrial specialists of national reputation. Each one of these men has put into the Factory Management Course and Service those essential things in the way of method and principle which he has demonstrated as successful and practicable during his many years of practice in the industrial field.

The successful experience of other large industrial organizations in having the training brought to their men should indicate the opportunity of strengthening your own organization.

If you will telephone or write to the Institute one of our directors will be glad to arrange an interview for further details of our plan, which means no expense to you.

INDUSTRIAL EXTENSION INSTITUTE

9 EAST 45 STREET, NEW YORK CITY

The Only Complete Course in Industrial Management

Digitized by Google

THE MOST ECONOMICAL AIR COMPRESSOR AND VACUUM PUMP

NASH HYTOR

THE HYTOR COMPRESSOR is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

The rotor, the only moving part, is cast in one piece, the blades being rigidly reinforced by shrouds. The rotor is mounted on a short, stiff shaft supported at each end by the highest grade annular ball bearings mounted outside of the casing.

As the peripheral clearance is large, there is no possibility of the ends of the rotor blades coming in contact with the casing.

The original high efficiency is maintained indefinitely in continuous service.

The air is thoroughly washed during compression and contains no oil.

Hytor compressors occupy very much less floor space and are much lighter in weight than reciprocating compressors. They run without vibration.

The cost of installation is greatly reduced as no expensive foundations are necessary.

No expert attendance is required as there are no adjustments to make. The cost of upkeep is negligible.

Hytor compressors are quiet in operation.

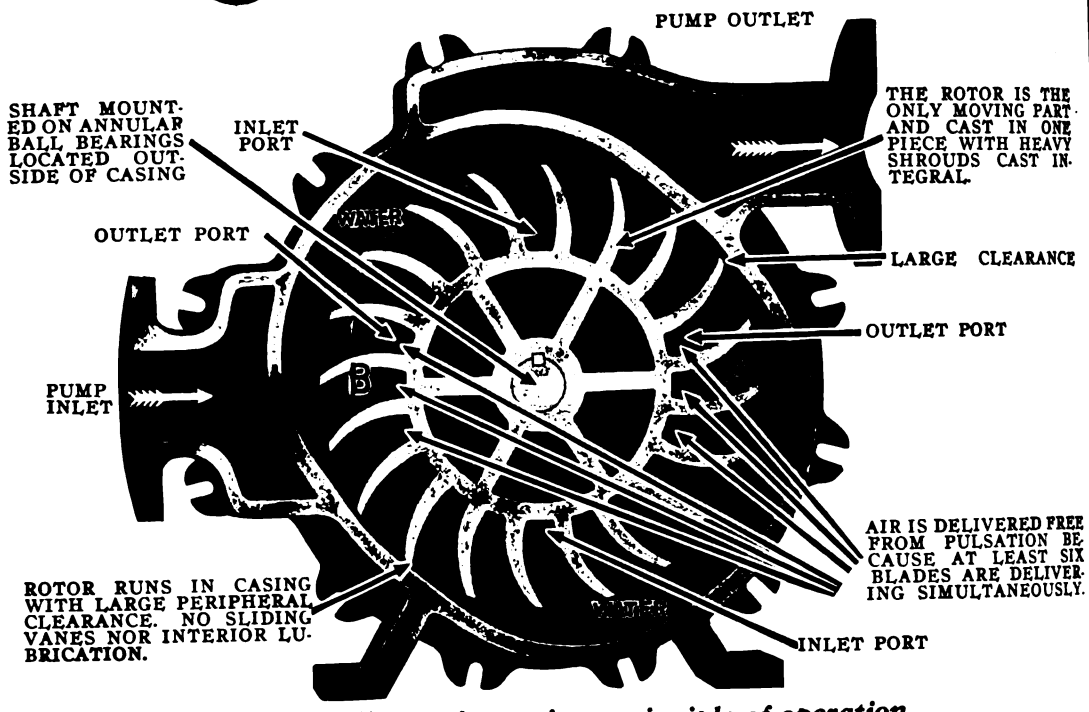
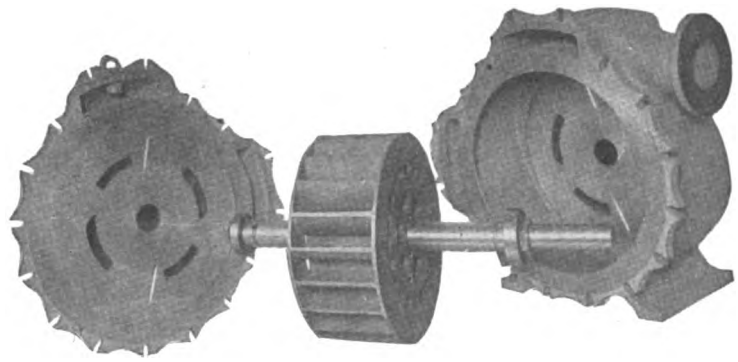


Diagram illustrating unique principle of operation



A ROTOR in hydraulic balance revolves freely in an elliptical casing filled with water. The water, turning, with the rotor, and constrained to follow the casing by centrifugal force, alternately recedes from and is forced back into the rotor, twice in a revolution. As the water recedes from the rotor it draws in air through the inlet ports. When the water is forced back into the rotor by the converging casing, the air is first compressed and then discharged through the outlet ports.

All the parts of the Hytor

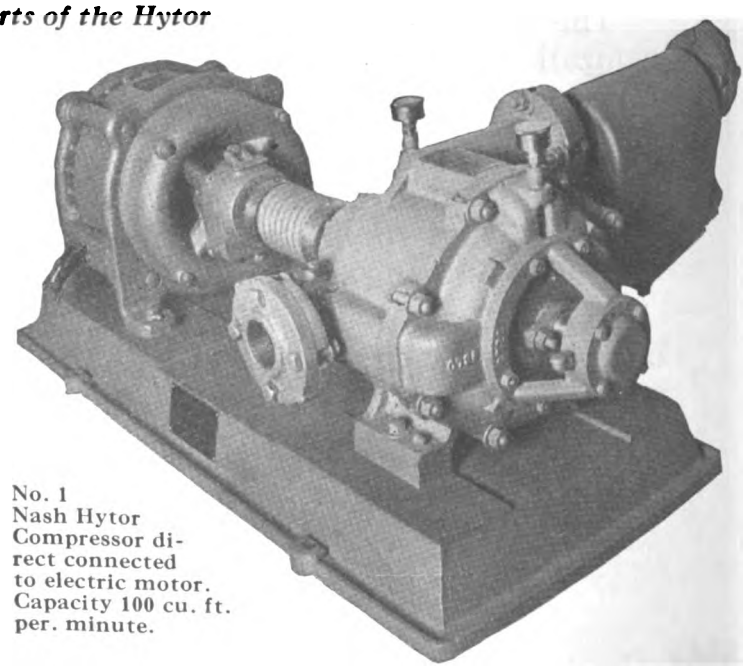
This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.



At pressures up to and including 15 lbs. per square inch, and vacuums up to 20 inches of mercury, the Nash Hytor affords the simplest and most economical means for handling air or gas, for all of the usual purposes where air under pressure is required, and they can be used on many special services for which the ordinary compressor is not adopted.

It is common practice in handling mildly acid vapors to re-circulate thru the pump an alkaline solution for the protection of the cast iron structure of the pump. In handling chlorine gas, concentrated sulphuric acid is re-circulated.

Air handled by the Hytor is delivered absolutely clean and free from dust or oil; a great advantage in the agitation of good products or in absorption processes where diffusion of air is accomplished by blowing thru filters, porous blankets or small orifices.



No. 1 Nash Hytor Compressor direct connected to electric motor. Capacity 100 cu. ft. per. minute.

7

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps
- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps

NAME.....

POSITION.....

COMPANY.....

ADDRESS.....

NASH ENGINEERING CO.
SO. NORWALK, CONN. U.S.A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate — Adolf Schildkraut, Art Director — Reginald Gordon, Associate

EDITORIAL

Today's Cost Cutting Tools

TIMES change and men and methods change with them.

Today the center of interest in cost reduction is the process as a whole. Ten years ago it was the individual machine.

For example:

Just about ten years ago, before there was such a thing as war-production or "cost-plus," the General Manager of a large manufacturing plant was told by his president that somewhere, somehow, production costs *must* be reduced—the where and the how, being for the G. M. to discover. The experience was not unique. It was, in fact, typical of the experience of hundreds of General Managers and Plant Superintendents; and his reaction to it, too, was typical.

This typical General Manager of ten years ago scoured the machinery market for machines that would better the performance of those in his plant. He speeded up, wherever possible, the individual machines; studied the individual operations with a view to saving time or labor on any or all of the operations performed; studied the layout of his machines, to secure better grouping and in some cases to put several machines under control of one man instead of two or three. By dint of any or all of these things—dispensing with an operative, cutting a few seconds off an operation, increasing the production of some of his machines—the General Manager of a decade ago brought his production costs down another notch.

But this was ten years ago—and a vast amount of industrial progress has been written into these ten years.

The problem today is not the same as it was ten years ago. The past decade has seen a perfection of machine design undreamed of before. The modern plant already has installed the best machines available for each of its operations. Moreover, these machines are capable of producing, in most cases, in excess of the plant's ability to use their output. There is scant hope of cost-cutting through better machines. Again, the modern plant has taken care of layout and grouping of operations; has already trimmed the seconds from its time per operation; has in most cases dispensed with every non-essential operative.

The General Manager of ten years ago was like the man who couldn't see the forest, because of the trees; his problem was one of perfecting the individual operations. Today, his problem is the process as a whole: with the individual steps perfected, *it is the gaps between these steps, that must be attacked.*

Every place in the plant where a man lifts or carries a part in process, there is waste. Every time a man picks up a part and puts it down, there is waste. Every place where partly finished stock accumulates, there is waste. And every time a machine is held up while work is being brought to it, there is waste. Waste of labor, which cannot compete with machinery in lifting or transporting; waste of time, through lack of co-ordination of all elements in the entire process; waste of money, through the staggering sums tied up in partly finished materials—money which must bear interest charges for every day these materials take to become salable products.

Shop trucks, lift trucks, cranes, hoists, conveyors—these are the *transportation* tools of cost-reduction today. Not merely in the speeding of individual operations, but in the speeding and co-ordinating and synchronizing of the whole process, lies today's broad path to lower costs of production.

Digitized by Google

What Ford Is Doing

BY JOHN H.

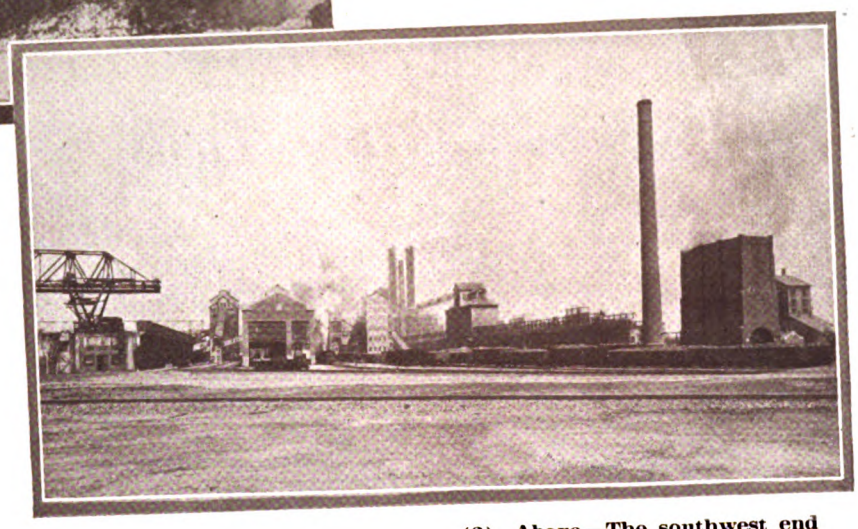
IT has been well said that a visit to the great River Rouge plant of the Ford Motor Company is necessary to provide the completion of a well rounded industrial education, because one can think of almost any problem in the effective utilization of modern machinery in making an engineering product, and forthwith find the answer to that problem in one or more of the forty-three buildings and departments of this plant. Unlike other machinery or motor car building establishments, Ford, at River Rouge, carries his manufacturing process all the way back to the basic raw materials—iron, coal and limestone.

Thus, the River Rouge plant of the Ford Motor Company is virtually one huge machine (taken in connection with Highland Park and the many widely distributed assembling plants) for converting ore, coal and limestone into tractors, trucks and motor cars. Such an exceptional plant naturally presents features of interest above and beyond those found in more conventional engineering works, to say nothing of the interest which always attaches to a Ford undertaking.

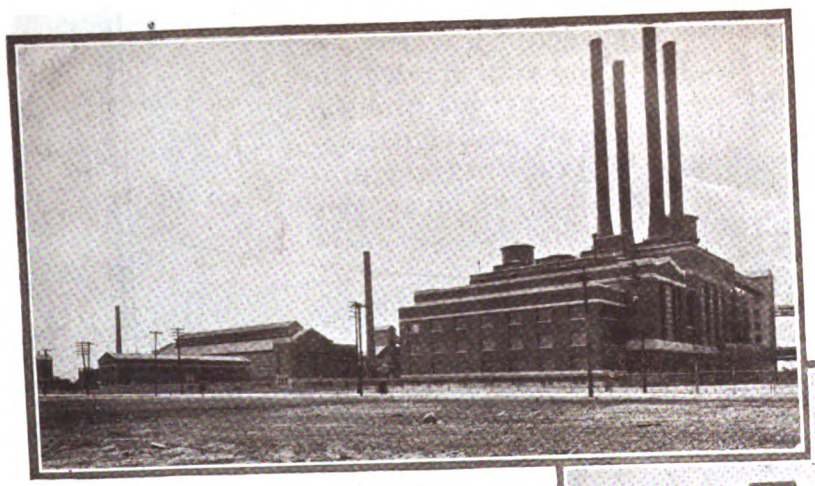
Henry Ford as demonstrated by his works, is undoubtedly an outstanding industrial genius. Steady growth of his company from a small beginning nineteen years ago to its present almost inconceivable proportions (in Detroit alone the Ford Company employs over 80,000 men or close to one-quarter of the entire working population) demonstrates this fact conclusively. During this



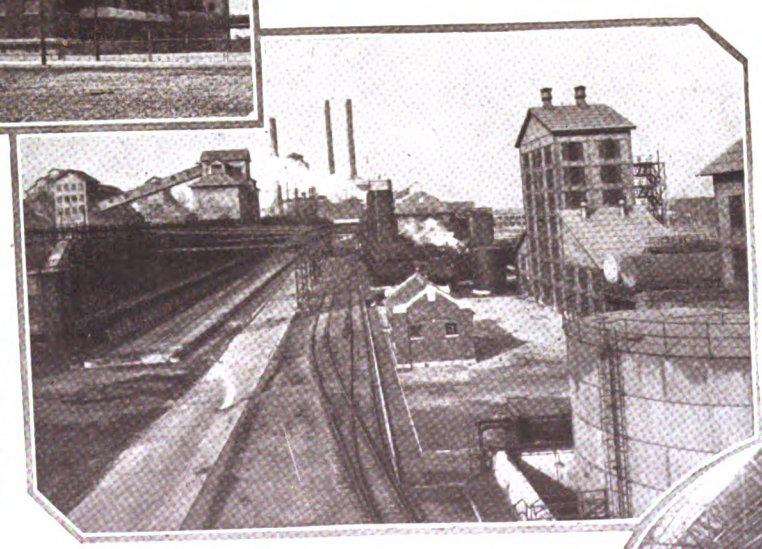
(1) The Ford industrial chain starts with the basic raw materials, iron and coal. This view shows a pile of ore at one of the Ford mines.



(2) Above—The southwest end of the River Rouge Ford plant, showing (at the extreme left) the "High Line," and in order from left to right: the Coke Screening Building, the D. T. & I. Railway Shops, Coal Breaker with Conveyor to Coke Oven Coal Pocket, Coke Ovens, Coke Oven Stack, and Coke Quenching Tower.



(3) Central Power Building at River Rouge. Its four 330 ft. stacks are to be supplemented by four more, giving the plant over one hundred thousand kilowatts power production.

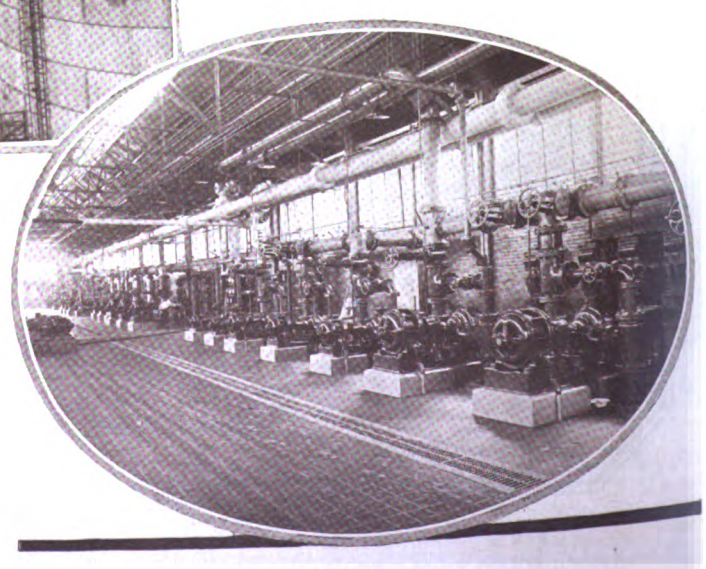


(4) At the right—A block of Coke Ovens are shown at the left of this view, with mains which convey the gases to the by-product plant. Producing a daily average of fifteen hundred tons of coke, the plant recovers some 22,000,000 cubic feet of illuminating gas, 10,000 gallons of motor benzol and many tons of tar and fertilizer.

(5) Below—The foundry at River Rouge—largest in the world—where, by means of moving platforms and conveyors, some 1,500 tons of iron are melted daily.



(6) Below—A section of the By-Product-Plant Pump-House, giving an idea of the scale of operations. These pumps are used only for circulating ammonia liquor for by-product extraction.



Digitized by Google

and How He Does It

VAN DEVENTER

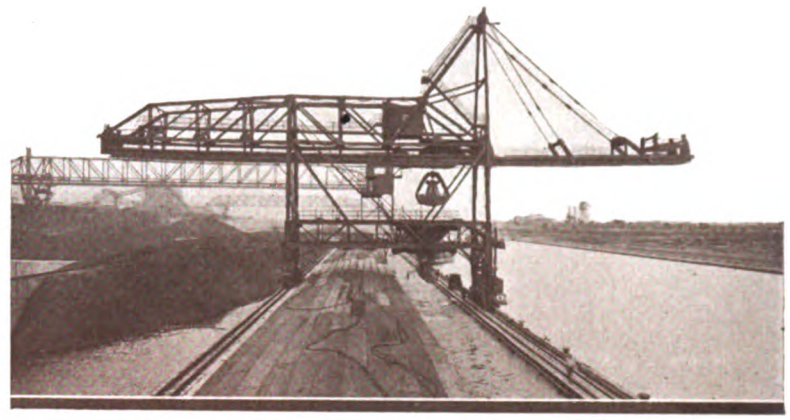
period of nearly twenty years this company has never experienced a strike.

River Rouge is the latest of the big Ford developments. Located on the river which bears that name the plant extends for a mile and a half in length and three-quarters of a mile in width. It is a busy area crammed full of the most up-to-date and ingenius machinery that money can buy and brains develop. But contrary to the general conception of those not acquainted with this plant scarcely ten percent. of this machinery can be designated as "special."

From the huge coal and ore unloaders on through the coke ovens, blast furnaces, power houses, foundry and machine shops, all of this machinery is co-ordinated into one big machine by a remarkable system of mechanical transportation. Raw materials, castings, coal and coke, machined parts and constantly growing assemblies flow through this plant in mechanical streams. Transportation sets the pace for production and no one can well or long outwit a mechanical pace maker. Defective machines and delinquent men are quickly and automatically revealed by this sytem and production becomes a formula in which "lineal feet of transportation per minute is the principal factor."

* * *

The Engineering Magazine Company, publisher of *Industrial Management* and *Industry Illustrated*, has been afforded the exceptional privilege of studying and describing this latest and most significant plant of the Ford Motor Company, just as it was privileged eight years ago to study and describe the great Highland Park plant of this same company. The presentation in this issue of Industry Illustrated and in other issues to come will be supplementary to the



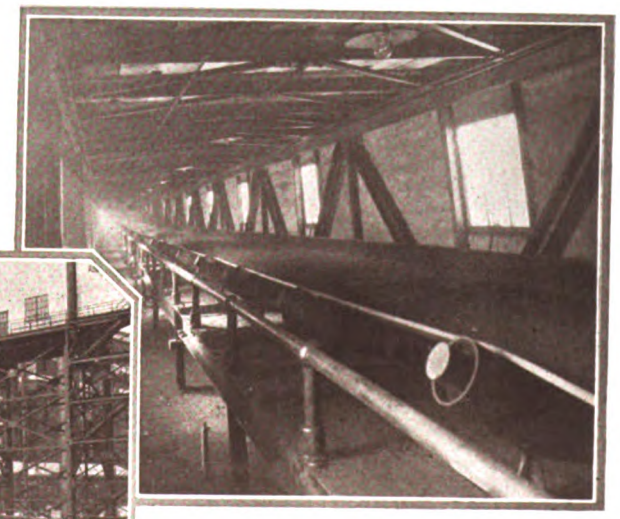
(7) A huge Mead-Morrison unloader of 625 tons-per-hour capacity, of which two are used in handling coal coming to the plant.



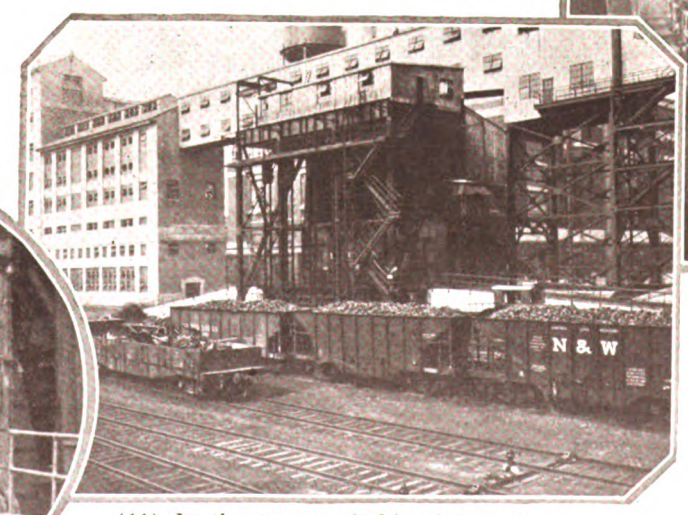
(8) The concrete primary storage bins, for coal, iron and limestone on arrival at the plant. The two ore bridges transfer these raw materials to transfer cars on the high line. Coal arriving by rail is dropped through the open girder trestle directly into the bins.

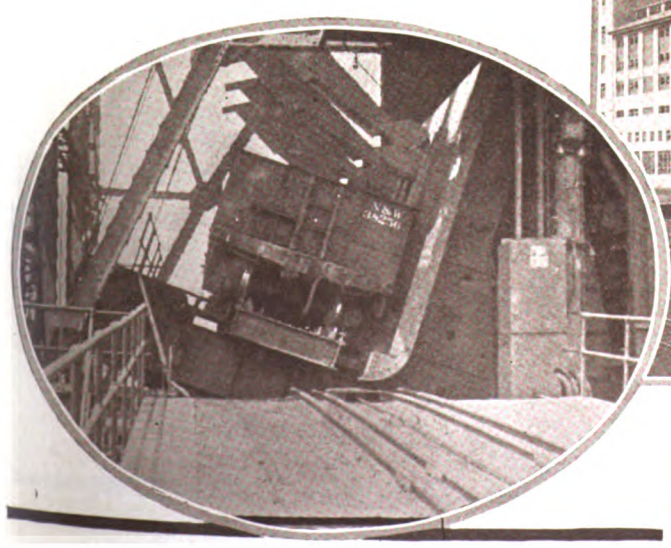


(9) Drop bottom cars may be dumped directly into the huge concrete storage bins at River Rouge. As shown in this picture and the preceding one, the "elevated railroad" overhanging the "High Line" makes this easy.



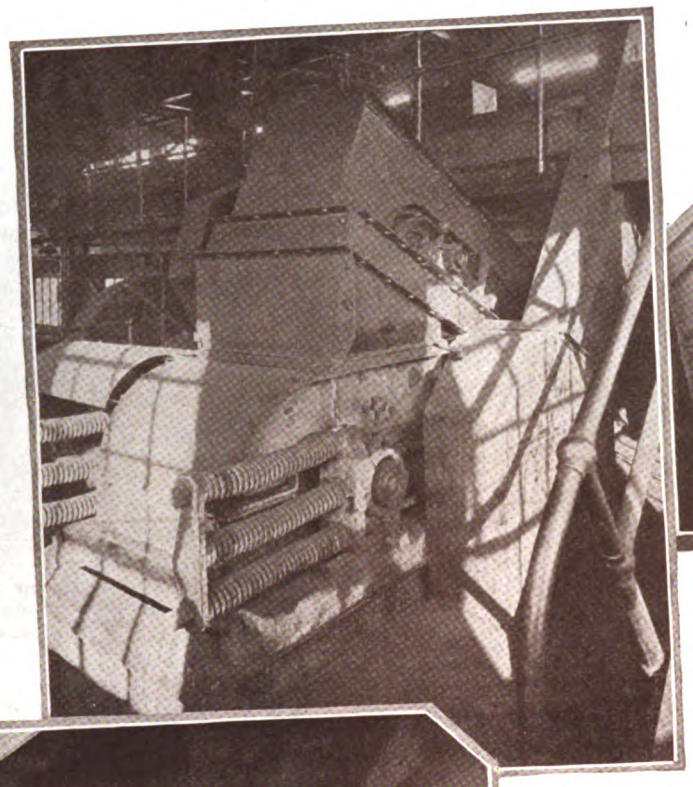
(10) One of the belt conveyors used on long distance coal and coke transporting. With a capacity of 640 tons per hour, this conveyor is typical of several used in this huge plant.



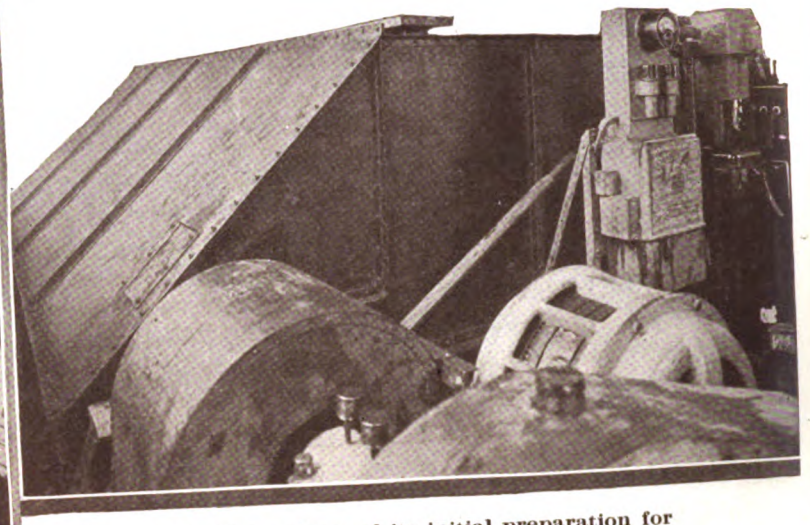


(11) In the center of this picture is the "car dumper" which, as shown in the adjoining illustration, picks up a loaded coal car and dumps its contents into hoppers. From here the coal goes via conveyor to the breaker building.

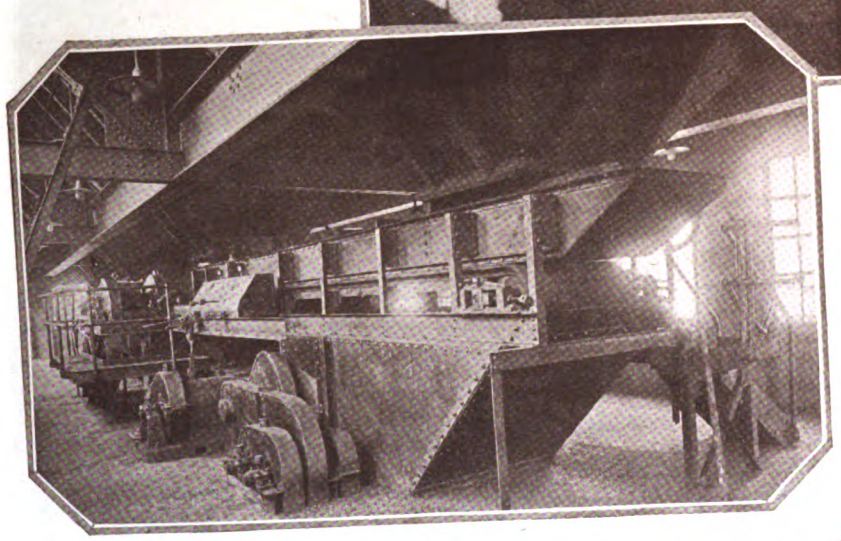
Digitized by Google



(13) The crusher which reduces the large coal for coking, delivering it to conveyor for carrying to the mixer room.



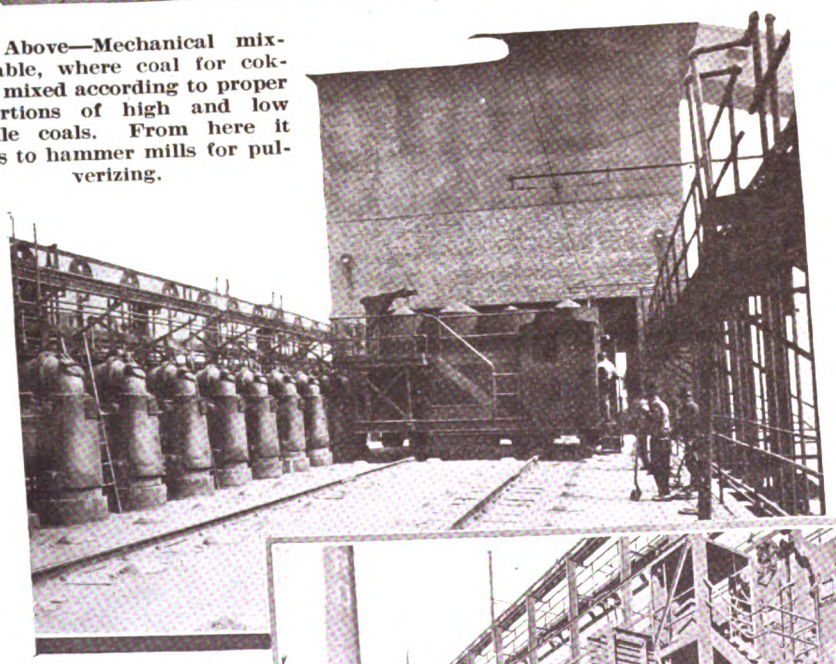
(12) Giving the coal its initial preparation for coking in the Breaker Building. Broken coal passes through the inch-and-a-half mesh screens, while the larger pieces pass on to the crusher.



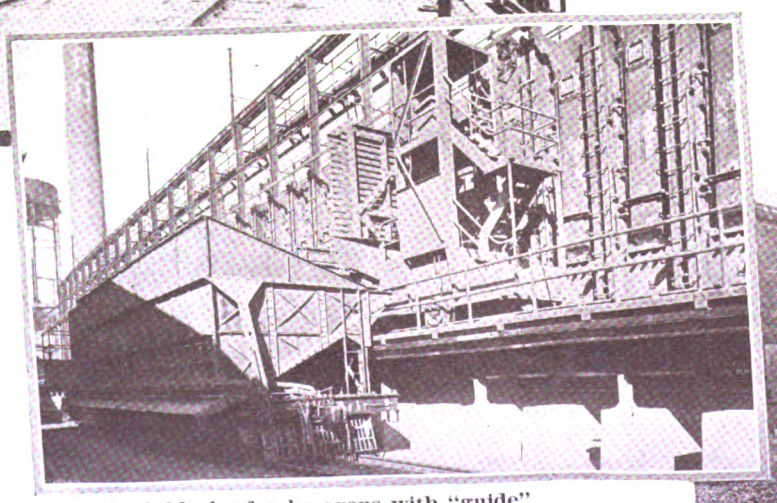
(14) Above—Mechanical mixing table, where coal for coking is mixed according to proper proportions of high and low volatile coals. From here it passes to hammer mills for pulverizing.



(18) The cast-iron-plate floor of the coke wharf is so inclined that the coke dumped on it slides down to the distributing gates. Here the conveyor-transportation of the coke begins.

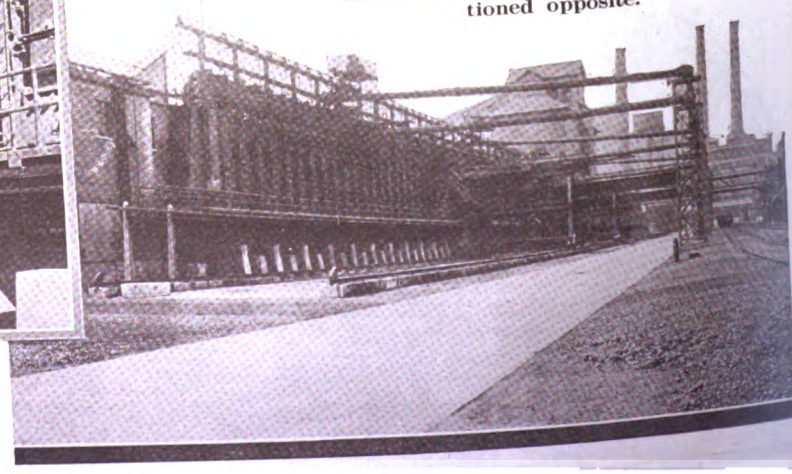


(15) Above—After pulverizing, the coal goes by conveyor to the charging bins; whence it is delivered to the coke ovens by electrically driven charging cars as shown here.

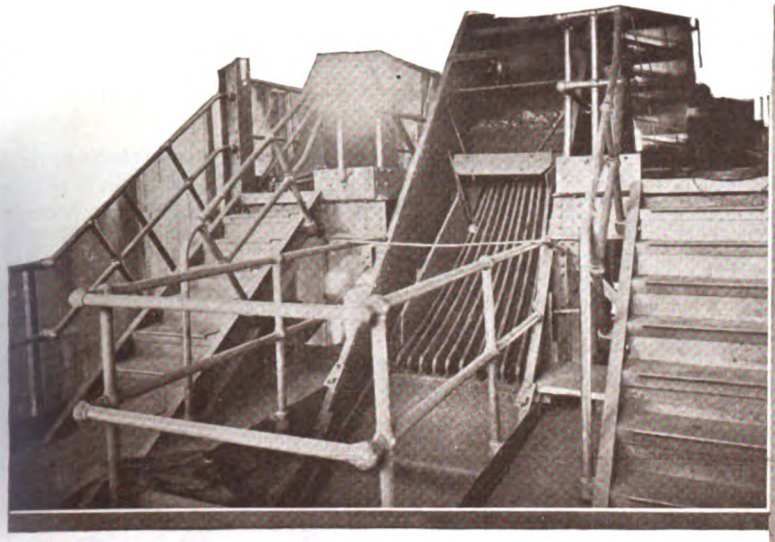


(16) A block of coke ovens with "guide" and hopper car in place to receive a finished oven-full of coke. Receiving its charge, the electric hopper car runs to the quenching station, where the coke is quenched, and then back to the coke wharf where its fifteen to sixteen tons of coke are discharged by gravity.

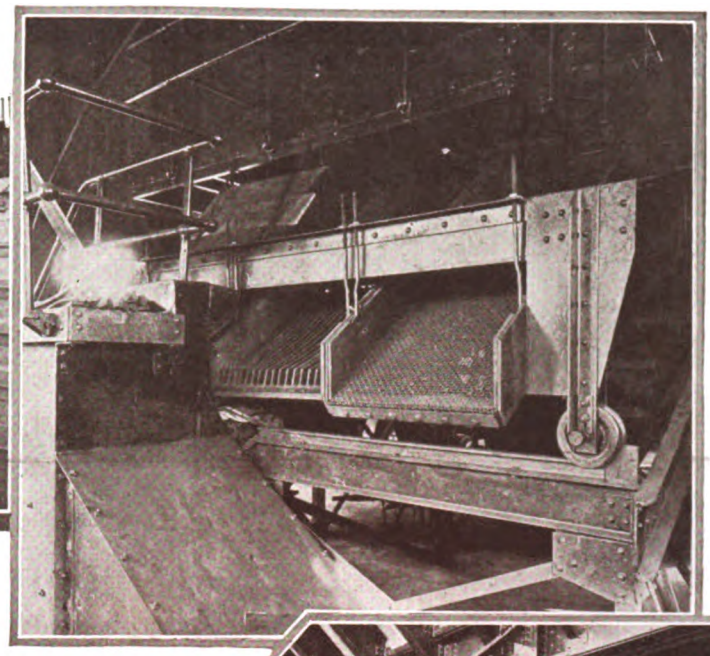
(17) Below—A view of the coke ovens from the side opposite to that which the coke hopper car traverses. The electric "pusher," by means of a huge power operated ram, pushes the oven full of coke into the hopper car stationed opposite.



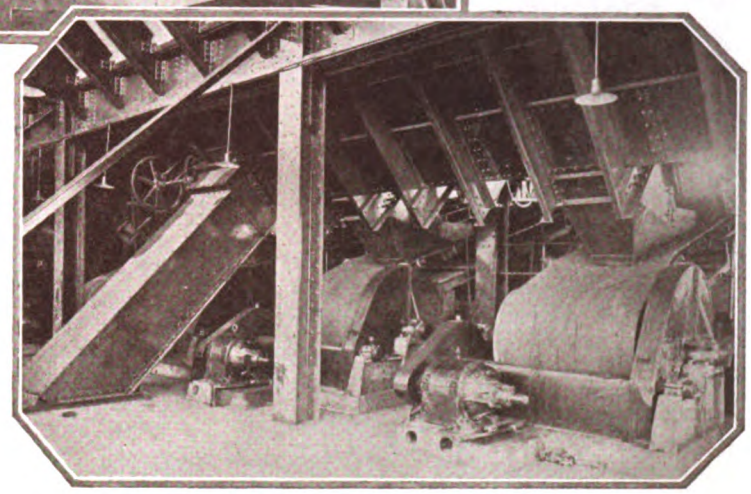
Digitized by Google



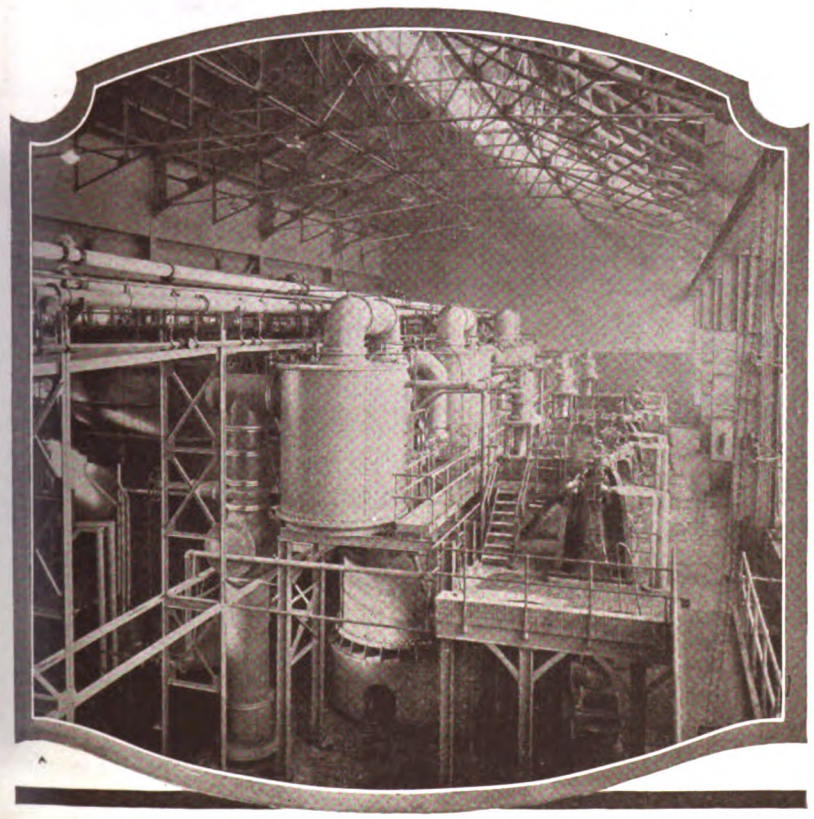
(19) One of the foundry screens, where the coke is separated according to size and delivered to the proper conveyors.



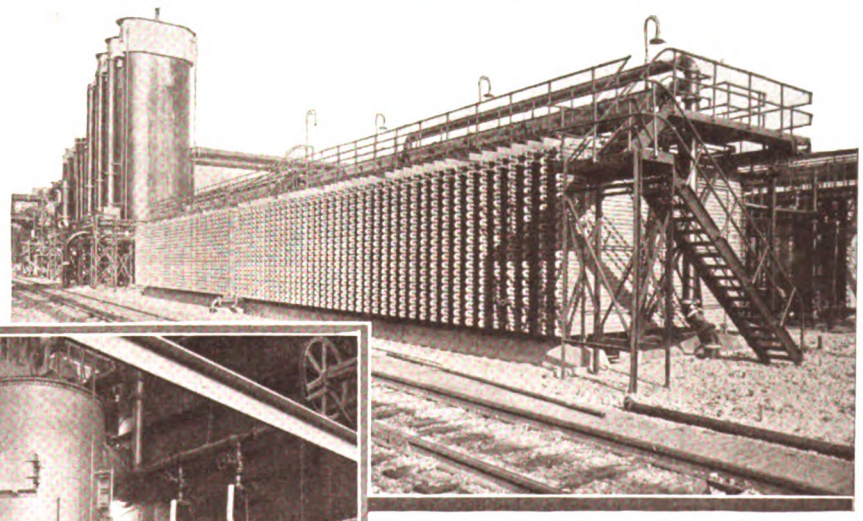
(20) Various sizes of screens and bars are used to grade coke that has passed the foundry screens into domestic, nut, pea, etc.



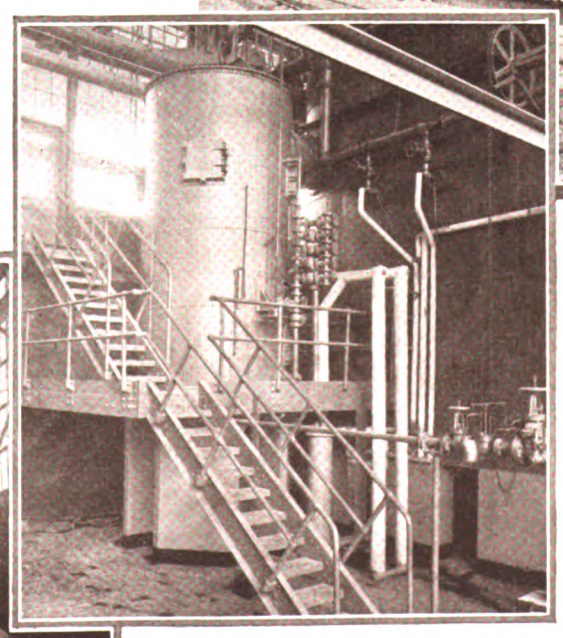
(21) Not far from where coal started on its travels, the coke finishes its journey. Here are the hoppers and belt conveyors under the "High Line," from which all coke (except foundry coke) is delivered to the High Line.



(24) A general view of the "Sulphate Plant," where the ammonium sulphate, second by-product of the coking process, is recovered.



(22) There are more than ten miles of pipe in these coils, which are used in cooling the ammonia liquor after it has sprayed the hot gases from the coke ovens to extract tar.

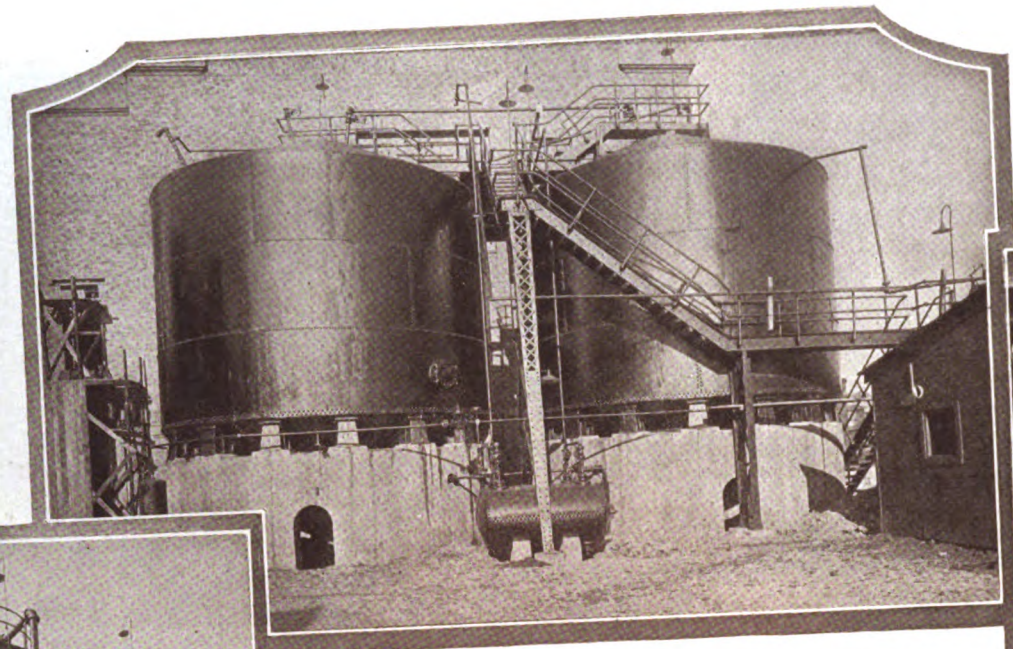


(23) At the left—The tar extractor, where the gases pass through small orifices and by natural expansion give up their tar in small globules upon striking the smooth surfaces beyond the perforations.

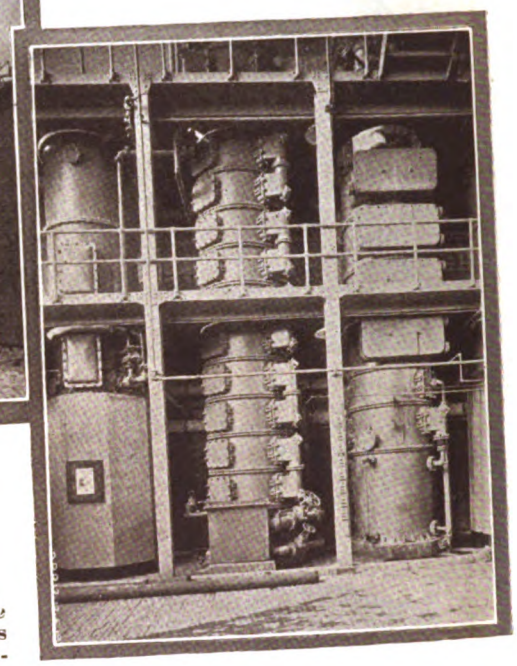


(25) At the left—An overhead travelling crane operating on the tracks seen at the top of this sulphate storage room, handles the finished fertilizer by means of a grab bucket.

Digitized by Google



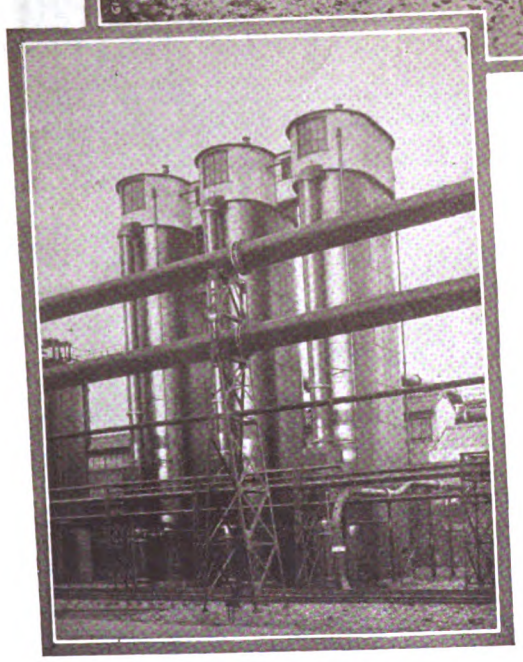
(27) Another view which gives an idea of the tremendous scale of operations at River Rouge;—the two huge sulphuric acid tanks, of 150,000 gallons capacity, which contain the acid used in the saturators for the extraction of ammonium sulphate.



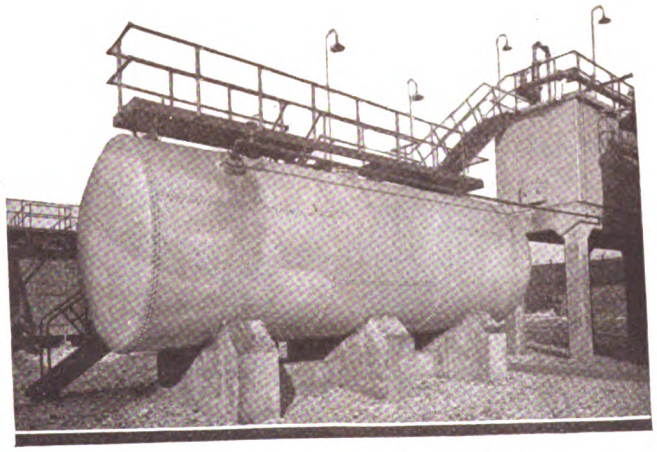
(26) At the right—The ammonia made in the "cooling and scrubbing" process (latter stage of tar extraction) is vaporized in the ammonia concentration stills shown here; adding this ammonia vapor to the gases entering the saturators, increases the yield of fertilizer.



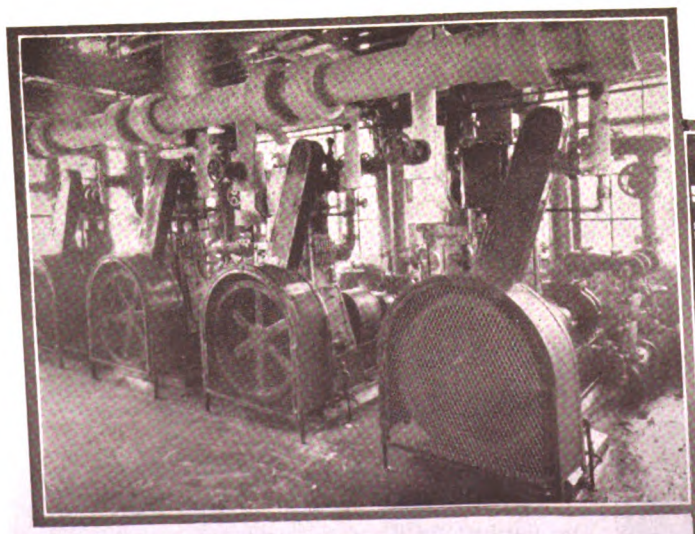
(28) At the left—After leaving the saturators, the gases (already freed from tar and ammonia) must be cooled—by spraying with water—to precipitate the napthalene.



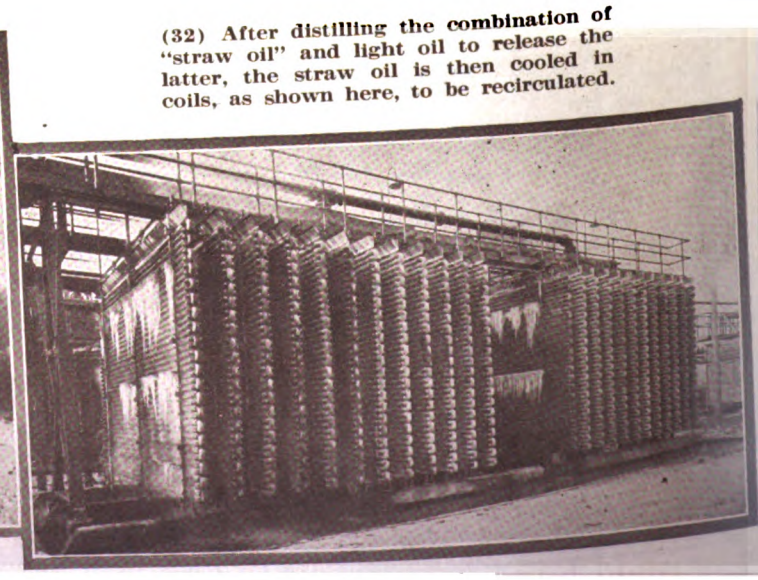
(29) The light oil, remaining in the by-product gases after removing naphthalene, cannot be removed by direct cooling; but by spraying with "straw oil," this light oil is removed—somewhat as mercury assists in recovering gold or silver.



(30) This is the circulation tank, adjacent to the decanter, shown at the right, where the "straw oil" is stored for recirculation.



(31) The engine driven rotary pumps at the right, furnish the motive power for circulation of the "straw oil."

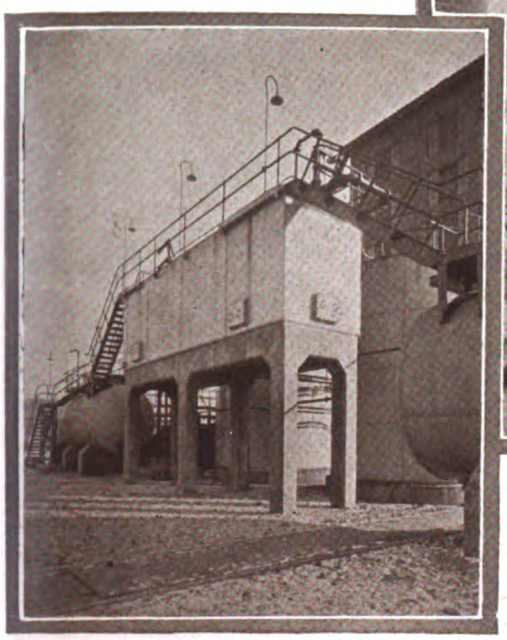


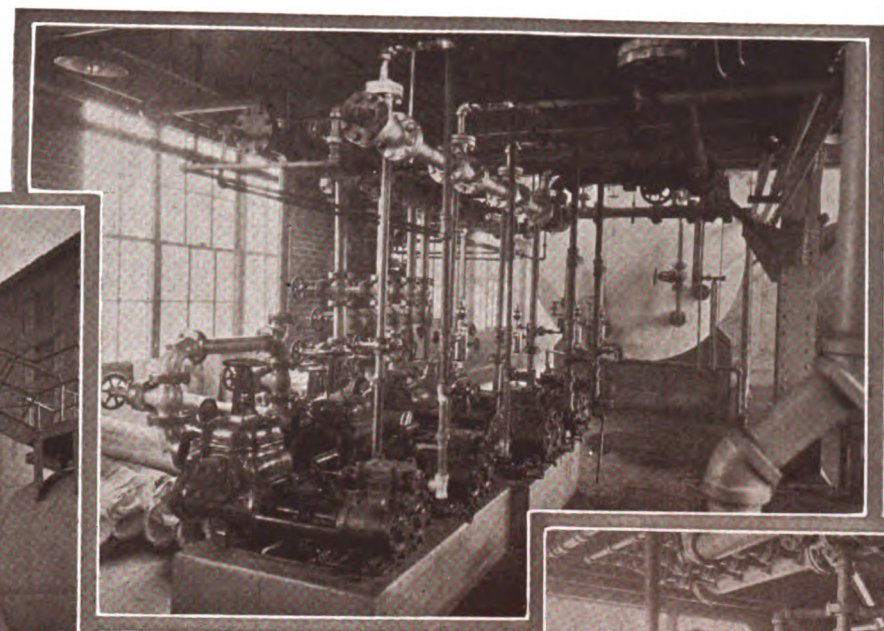
(32) After distilling the combination of "straw oil" and light oil to release the latter, the straw oil is then cooled in coils, as shown here, to be recirculated.

presentation of the Ford principles and practice now appearing serially in *Industrial Management*. The adequate description in any form of such a vast and variegated undertaking is difficult.

The conception of scope of the enterprise and its extent can best be conveyed pictorially. The principles underlying the operation of the various departments and the methods employed in them to produce a high quality product at an exceptionally low cost must be conveyed largely through text. Upon the pictorial background of *Industry Illustrated* we hope to paint a realistic picture of the great River Rouge plant—a picture that will be the next best thing to a personal visit, while in *Industrial Management* we are undertaking simultaneously a careful, detailed and thorough study of

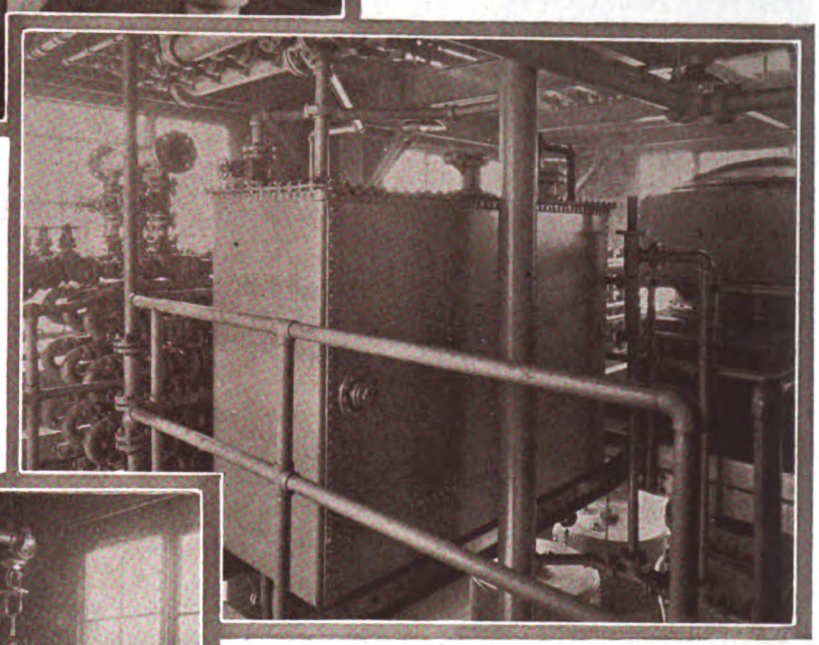
Digitized by Google





(34) At the left—These are the pumps which handle the light oil after it has been condensed.

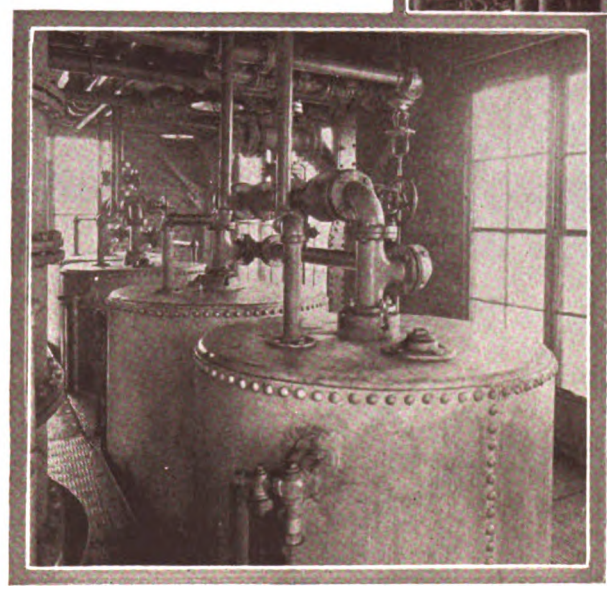
(33) At the left—The cooled straw oil, before recirculation, is decanted to remove the water it picked up in cooling. The oil is decanted in the decanter shown here, which is elevated above the circulation tank and "muck tank" on either side.



Ford operation and management.

So vast in extent and scope is River Rouge that we might fill all the pages of this issue from cover to cover with carefully selected illustrations with out fully covering our subject. When one visits this great plant, if he is to really see it and comprehend it, he must study it in sections and distribute his visits over several days at least. Otherwise his mind will become confused from seeing too much at once. On the same principle the reader's visit to River Rouge through the medium of *Industry Illustrated* must be in sec-

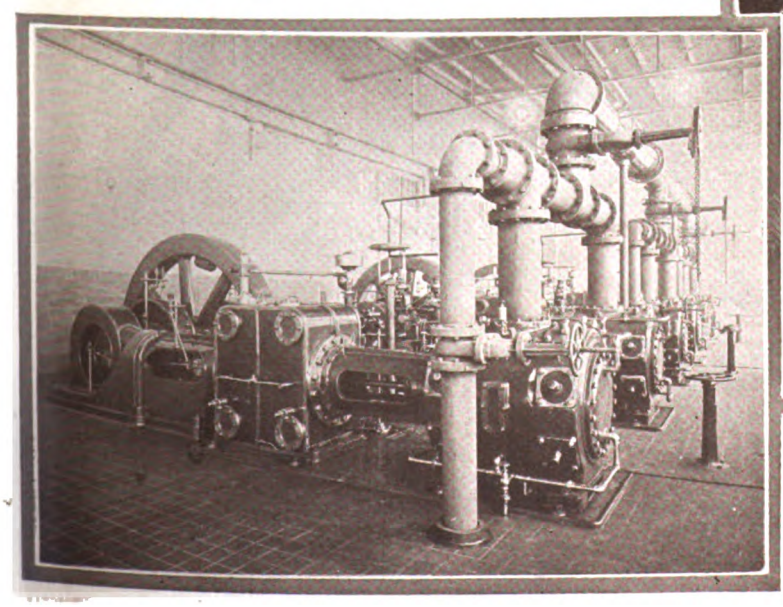
(*Continued on Page 46*)

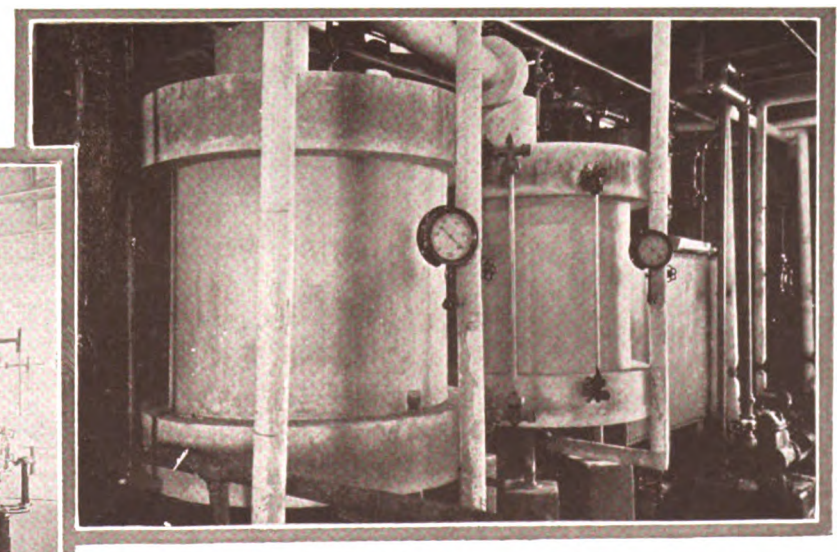


(35) Above—From the condensing coils shown at the left of the above picture the light oil goes to the separator (in the center) where it gives up its water.

(36) At the left—The light oil vapors, separated from straw oil in the stills, are passed through water condensing coils, then to a separator which removes the water, and the clean light oil passes to measuring tanks (shown here) and on to storage.

(38) Below—These compressors are employed for pumping the enriched illuminating gas to the municipal gas station, whence it goes into the city mains.





(37) Above—Illuminating gas is the last of the by-products obtained from the coal. About 87 percent of the gas produced at River Rouge is used in industrial heating processes within the plant. The surplus, after enriching with light oil vapors to the requisite candle-power and B. T. U. standard, is sold to the City of Detroit.

Digitized by Google

What Suggestion Systems Have Accomplished

Some Worthwhile Ideas Developed by the Rank and File

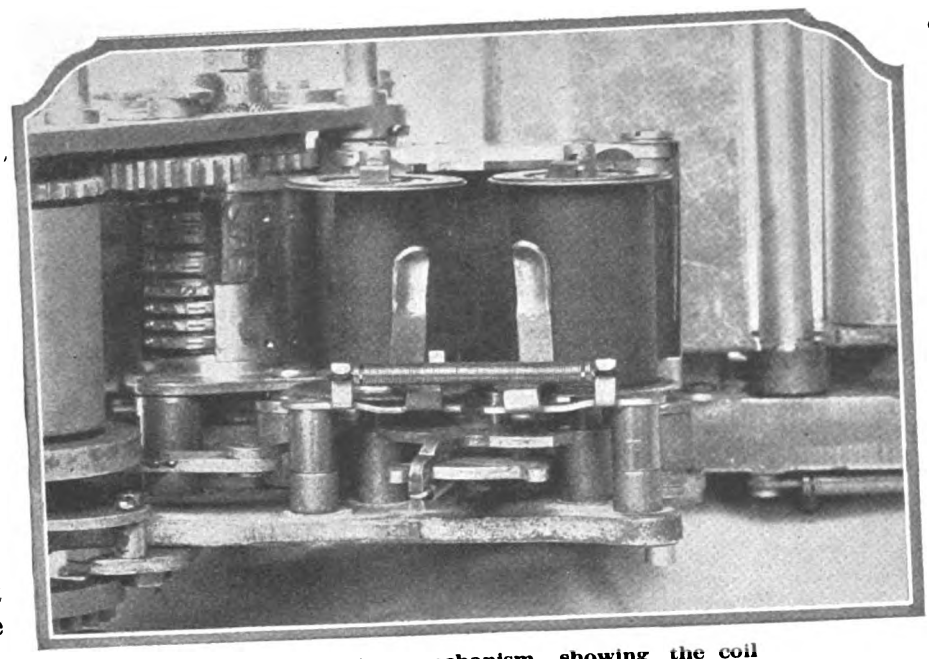
By Appleton Street

I'VE read a lot in the industrial papers about suggestion systems," said a successful factory manager recently. "I've read about how to organize a suggestion system, how to equip it and carry it on; how to stimulate suggestions from timid employees; how reward suggestions, the relative value of cash prizes and other kinds; how to break the news tactfully to an unsuccessful suggestor; and so on. I think I know pretty well how to install a suggestion system.

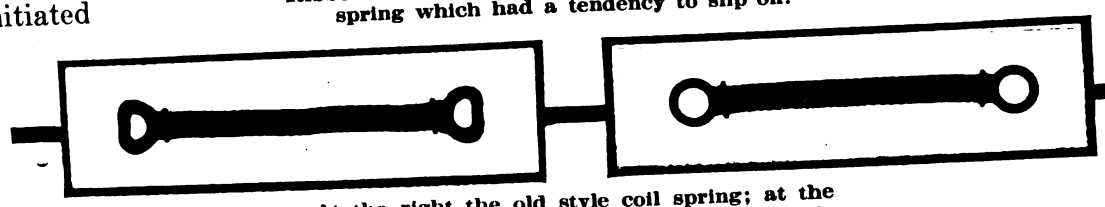
"But what I haven't read in any of the papers is an account of the results. Oh, of course there is mention of some occasional improvement initiated in this way, and there is always talk of the intangible results—the stimulation of employee interest and good will. But what I should like to know is the tangible return in acceptable, workable suggestions. What sort of suggestions do employees make? What actual results have been accomplished through the offer of prizes for ideas? That, after all, is the question of first interest to a manager who is considering the introduction of a suggestion system into his plant.

"In other words, while I know fairly well what a suggestion system is and how it is installed and operated, I'm not convinced yet that it is worthwhile."

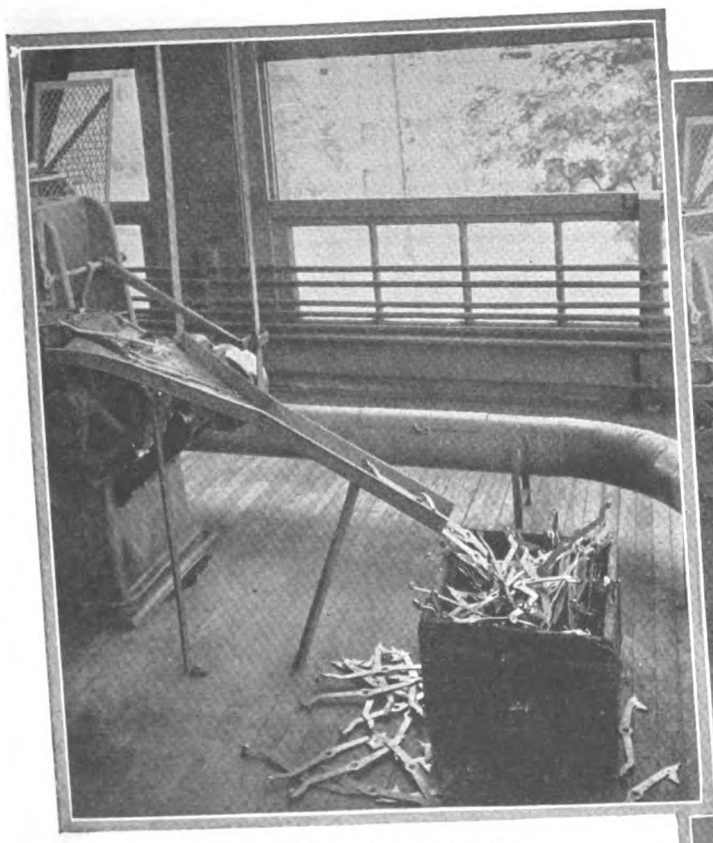
This is a valid objection. No factory man is interested in a suggestion system for its own sake, but only for the results which it will bring. How to install a system is secondary to the question: Is it worth installing? And so, as a result of this chance objection, which



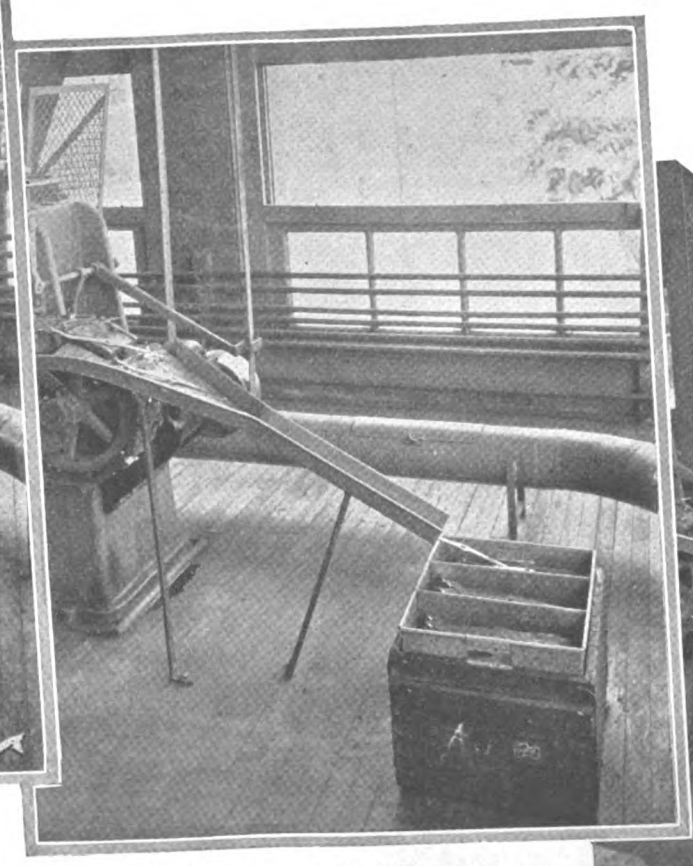
Ribbon-reversing mechanism, showing the coil spring which had a tendency to slip off.



At the right the old style coil spring; at the left, the flattened eyes that cured the trouble in the mechanism shown at the top.



These register keys used to come from the polishing machine as shown here, after which they had to be laid straight by hand.

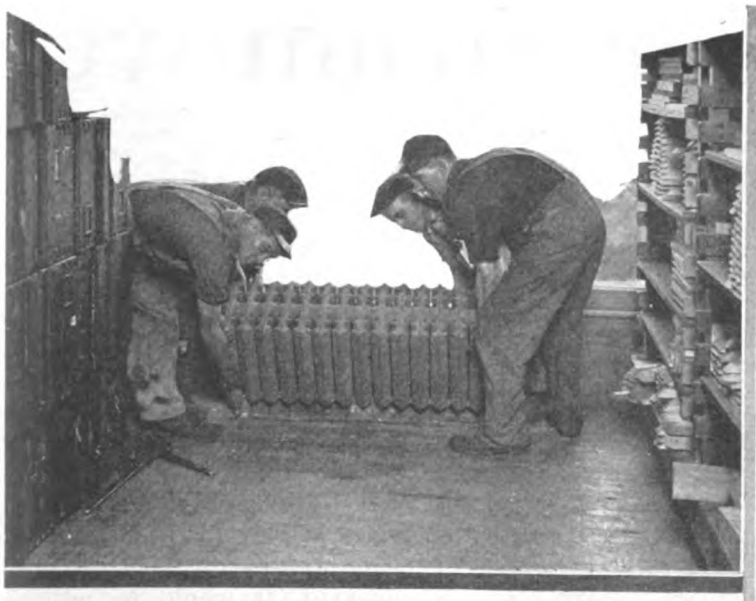


The only way these register keys can now go into the box, is by aligning themselves—saving the extra work.

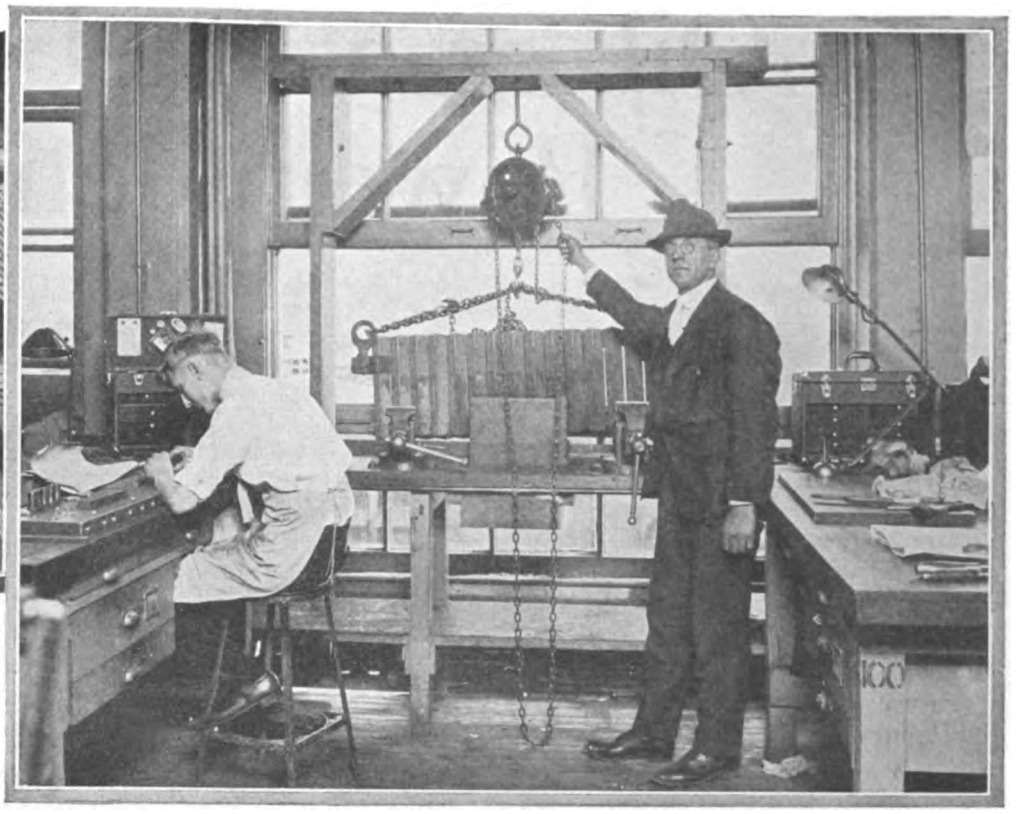
Below—When the box is full, the metal compartment box is removed; leaving the keys in orderly array.



Digitized by Google



Four men and much disturbance of surrounding work, under the old method of repairing and re-packing radiators.



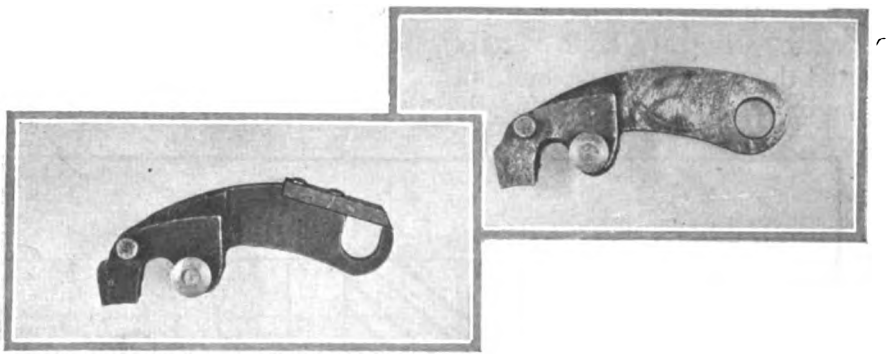
This simple rig and hoist enables one man to attend to radiator repairs, with a minimum of disturbance to work in the immediate vicinity.

we ran across in the course of an inquiry into the various types of suggestion systems, we are going to make this article entirely an account of results—a report of successful suggestions submitted by employees and put into practical use in the plant.

At the outset it is important to recognize the obvious limitations. A suggestion system will not turn the working force into a group of Watts, Stephensons, Whitneys, Edisons, and Westinghouses. Normally only a small percentage of the suggestions offered will be practicable, and of these only a fractional part will be of outstanding value. Too often a plant manager expects a suggestion system to work wonders and transform plodding workers into brilliant innovators, whereas all it can do is to stimulate latent initiative and get the workers to think constructively and in terms of improvement.

This thought of improvement at the beginning may take the most obvious and trivial forms. There will be suggestions reporting a leaky faucet in the washroom, a broken floor, a dirty window, or some other such fault. Some educa-

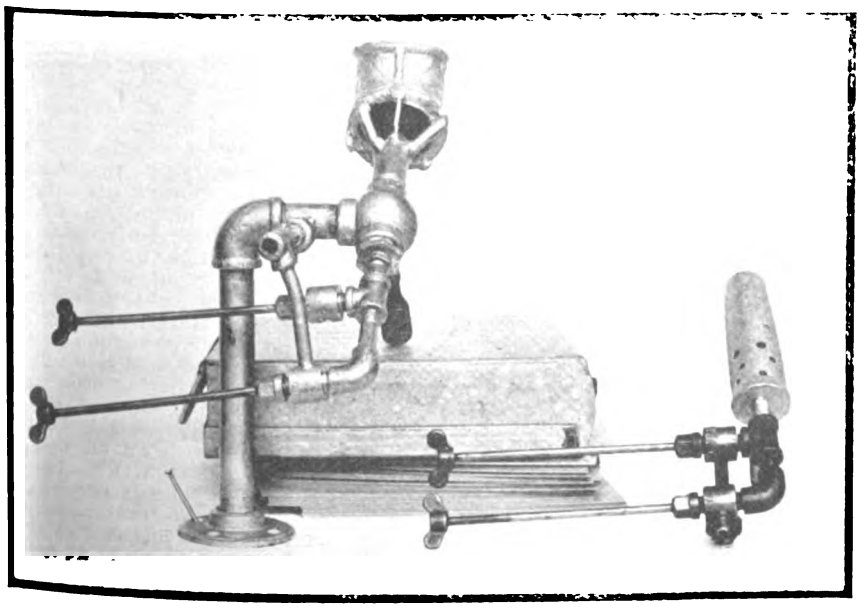
(*Continued on Page 66*)

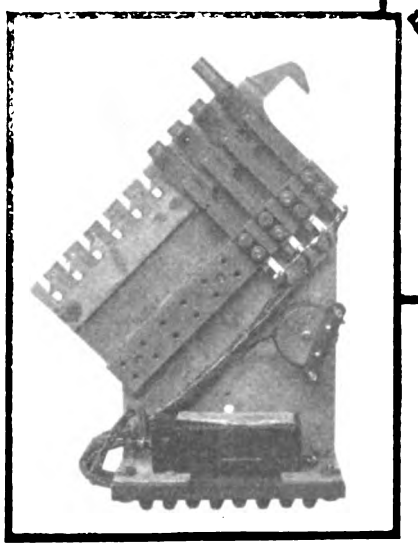


At the right, a switch lock lever which necessitated taking out cam line and retiming, when replacing lever. By making it as shown at the left, this trouble was done away with.

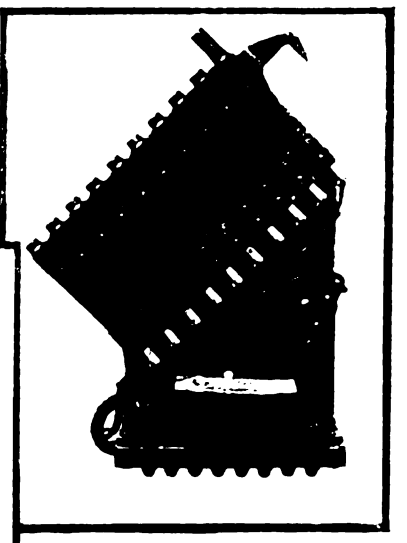


Above—an oil burner developed in a plant's own plumbing shop; used in heat treating.





At the left—two more burners developed by employees at the same plant as cited above. These burners are used in various production departments and are both cheaper and better adapted to the work.



Above is a telephone frame with ten keys, as formerly built. An employee discovered that a majority of systems used only four keys; so the frame is now made as shown at the left.

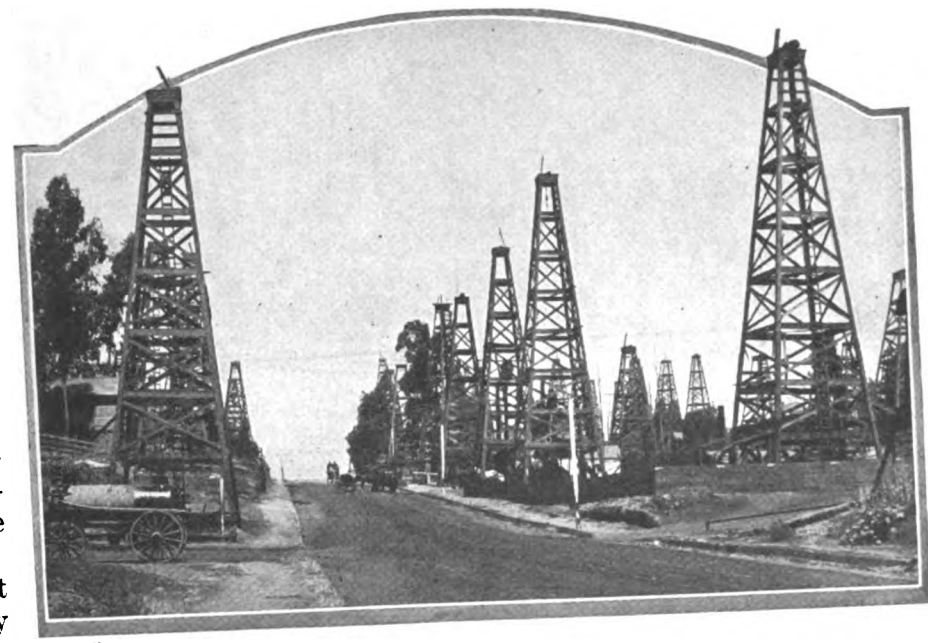
Digitized by Google

Oil, as a Fuel for Steam Power Generation

By W. Thomson Lees

OIL fuel when compared with coal possesses one advantage that has not been stressed—it is not hampered by tradition and haphazard development to anything like the same degree as coal. Oil fuel came into the industrial field sufficiently late to benefit from the mistakes and experiments made with coal; there was less of the "cut and dry" and more of scientific and engineering knowledge in the very beginning. As a result, developments in oil burning have been extraordinarily rapid.

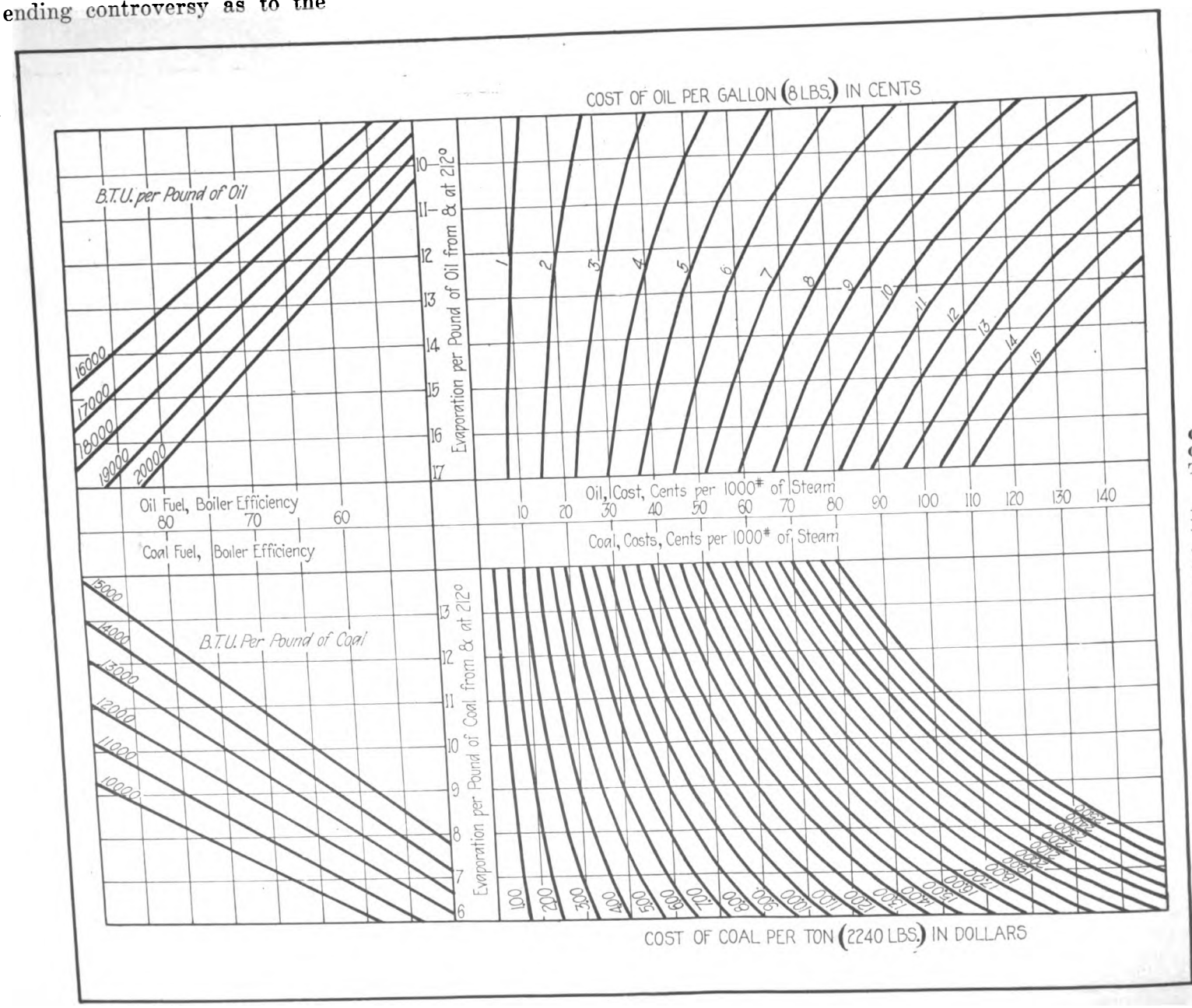
There is no question but what fuel oil would entirely supplant coal, except for two factors: the available supply, and the price. There is an unending controversy as to the former; some eminent authorities maintaining that our undeveloped oil resources are practically unlimited, while others, equally eminent, state that there isn't enough oil to last a century. In the light of past history on such matters, however, it would be well to take the pessimists' predictions with a grain of salt—especially when we consider the vast shale deposits, as yet practically untouched, and which require but applied inventive genius to make them yield their oil at a reasonable cost.



© Galloway

Scene in the oil fields of Southern California. Once oil is found, getting it to the surface doesn't involve going down after it, day by day.

The question of price has been a serious one. Oddly enough, it has been not so much a matter of *high* price as of *fluctuating* price. Whereas the price of coal, though it has mounted, has been steady and predictable over a period of months, the price of fuel oil has varied within wide limits over a period of mere days. Nor has there been any assurance of a maximum limit on the price of fuel oil during a coming



COMPARATIVE COST OIL VS. COAL PER THOUSAND POUNDS OF STEAM.

Knowing efficiency under which plant is operating on oil or coal and the calorific value of the fuel, the evaporation per pound of coal or oil may be found by following vertically the efficiency coordinate, to the straight line showing the calorific value of fuel, and then running horizontally to the right to evaporation per lb. of fuel. If the cost of fuel is known, continue the horizontal to the curve representing cost of fuel and then vertically to the scale of cost per thousand lbs. of steam. Ex.—Efficiency is 75 per cent with an oil fuel of 18,000 B. t. u's, and oil costs 3 cents per gallon, then the evaporation is 13.9 lbs. and cost of 1000 lbs. steam about 27 cents. Same method for coal.

Digitized by Google



© Galloway



(Courtesy of "The Lamp")

"Capping" a gusher in the modern way. This one was choked off in seven minutes; saving thousands of gallons of oil, which used to be wasted while a new well was brought under control.

Installating a pipe line through the "wilds." The men are here cementing a section of the line.

twelve months or more. Obviously, this uncertainty has operated to discourage a number of interested power men from changing their plants over.

In the past, too, the executive in charge of the average industrial plant has had little detailed knowledge of power generation. It has been the general practice to consider the power plant as a separate domain—a more or less independent kingdom within the works, under complete charge of the power engineer. And only the more progressive of power engineers has kept abreast of recent developments; there are still a great many engineers in charge of power plants, who are so steeped in traditions that only an earthquake could shake them loose from their convictions—these convictions being that there never was, is not, and never will be anything but coal as a primary heat source for power generation. Only an awakened interest on the part of the man higher up, can force these men to see the light; and that awakened interest is beginning to make its appearance as a result of the closer scanning of balance-sheets which carry an ever-increasing charge for power.

It is easy enough to figure the evaporation secured from a given number of tons of coal, as compared to the evaporation obtained from a given number of barrels of fuel oil. It is easy to figure the brake-horsepower-hours for a specified quantity of fuel oil, as against the horsepower hours for specified amounts of a specific grade of coal. But these figures mean something only when we can convert them into



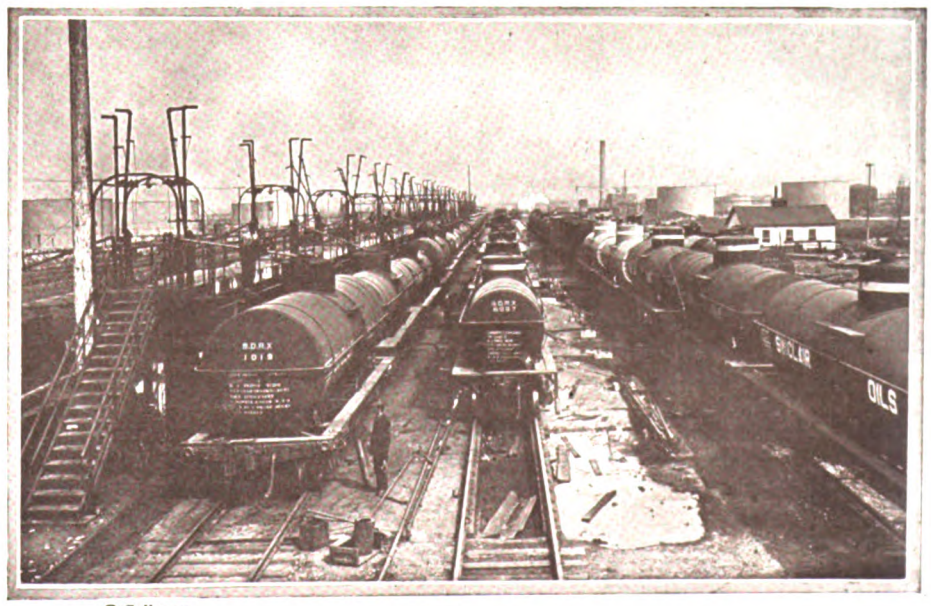
(Courtesy of "The Lamp")

At the right—Sectin of a completed pipe line. These lines run from oil well districts, often hundreds of miles, to the refineries, furnishing a cheap, rapid means of transporting the crude oil.



© Galloway

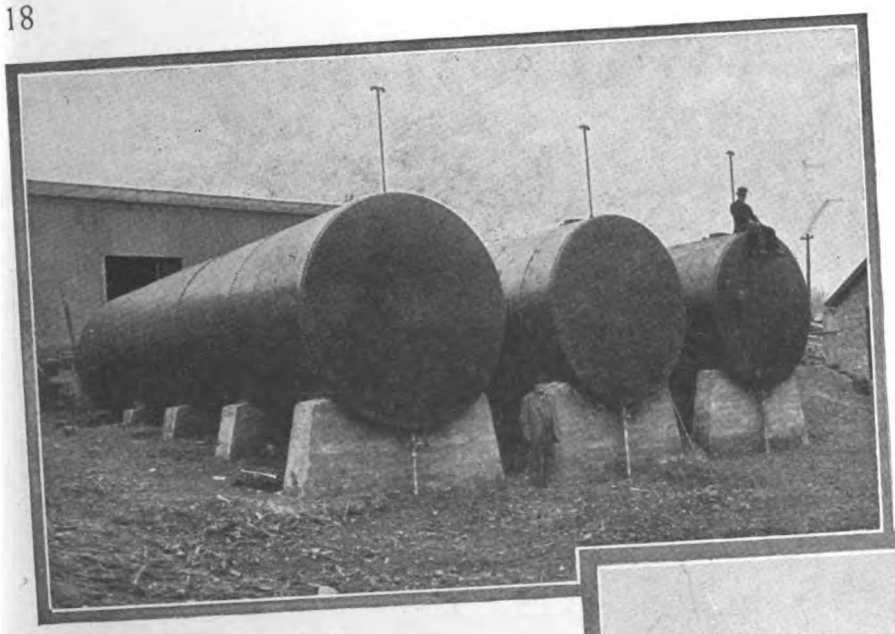
Typical tank cars, used to transport the oils from the refinery to consumer.



© Galloway

Loading ranks (Sinclair Oil Refinery, East Chicago) by means of which tank cars are filled expeditiously.

Digitized by Google



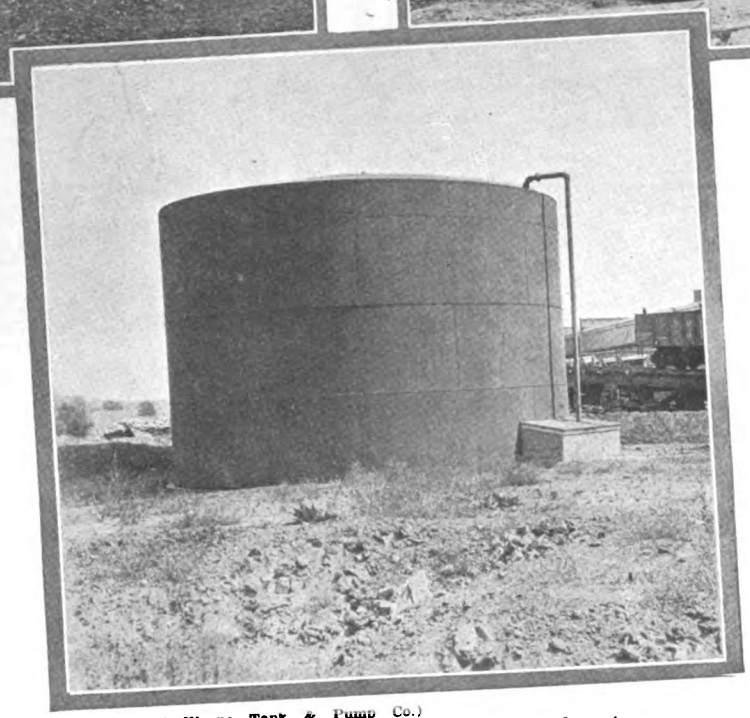
(Courtesy of S. F. Bowser & Co.)

Above-ground oil storage tanks. Similar installations are used at power plants where oil-fuel is burned.



(Courtesy of S. F. Bowser & Co.)

Underground storage, such as this, is a radically different proposition from the space-consuming coal yard or pocket.



(Courtesy of Wayne Tank & Pump Co.)

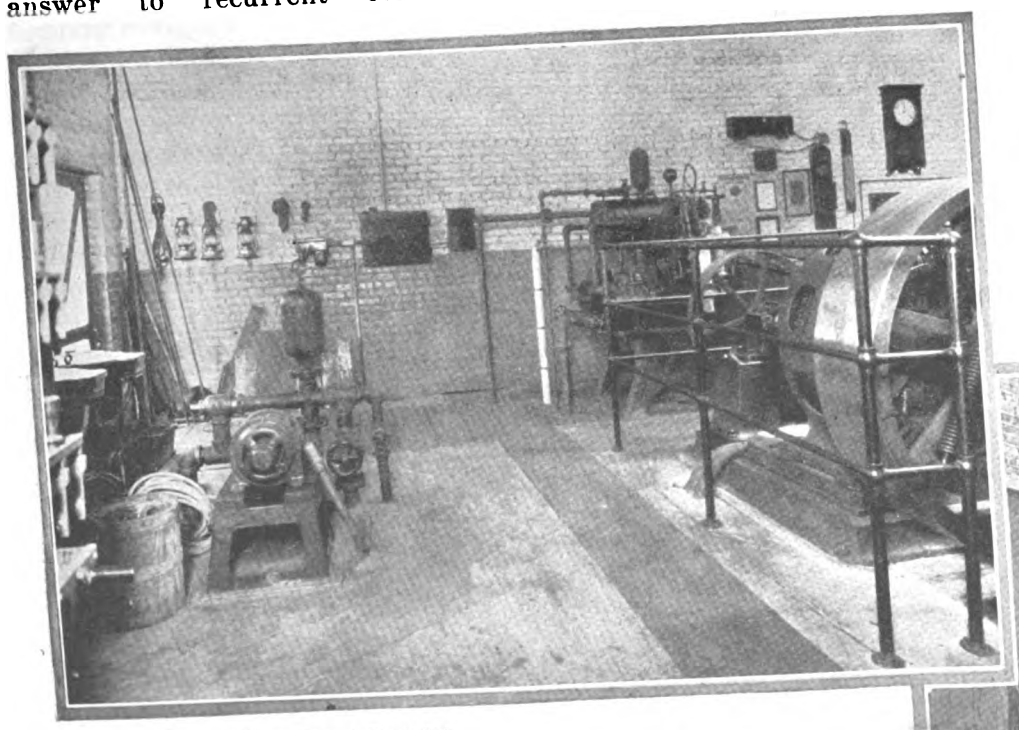
One hundred-thousand-gallon tank at the Moline Malleable Iron Co., St. Charles Ill. Oil is pumped from tank cars into this huge field tank, from which it goes to a 20,000 gallon underground storage tank; being pumped to the burners from there.

terms of cost. Abstract comparisons are well enough for the enthusiast and the experimenter, but what Industry needs — what the whole world needs—is *cheaper power*. If tomorrow we could produce power in unlimited quantities, at half the present cost, civilization would accomplish a century's growth overnight. Not merely industrial processes, but the whole social structure would be revolutionized for mankind's immeasurable benefit.

Fuel oil, in the present state of our knowledge, is not the answer to recurrent coal strikes, nor does it, right now, offer a universally applicable remedy for high coal prices. As stated in a previous article, there is no single, magic solution to what has been called our power crisis; but oil is *one* of the answers—of increasing importance, and capable of immediate application in a great many instances.

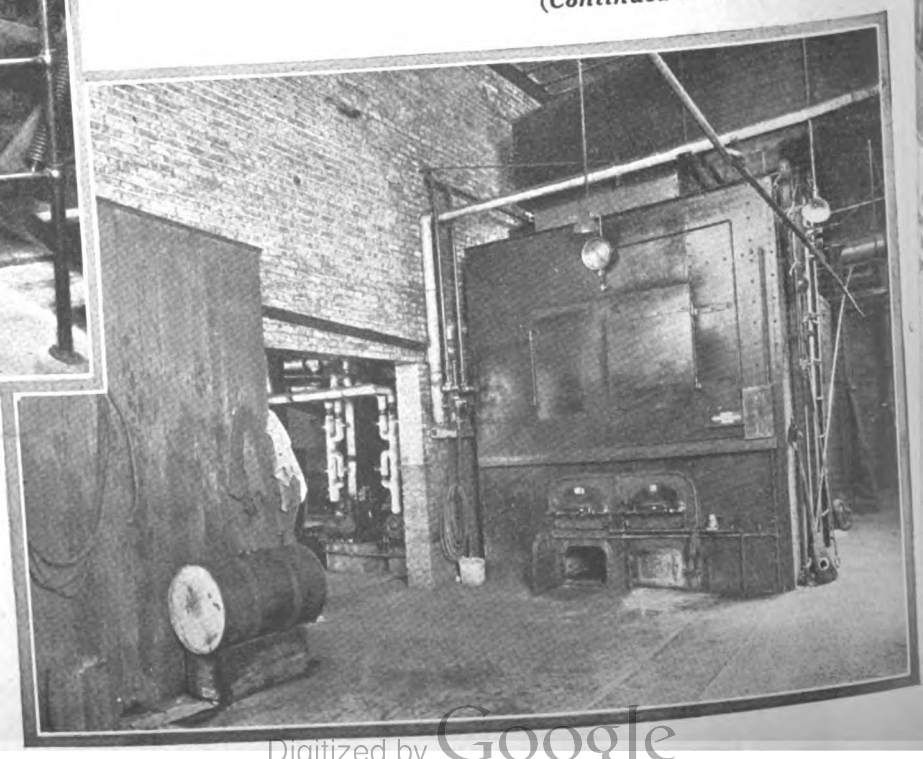
The automotive industry, from its start, has been one of the most progressive of modern industries; yet, even with its progressive ideals and far-sighted men, it took this industry a long time to strike out away from the traditions inherited from its ancestor—the carriage makers. Some of the first automobiles actually had whip-sockets on the dashboard —not because they were of any use, but because pleasure vehicles had always been made that way. Ridiculous as that idea seems today, it is no more ridiculous than a great many

(Continued on Page 48)



(Photos, Courtesy of Wayne Tank & Pump Co.)

Motor-driven impeller type pump which handles the oil for the installation at the Moline Malleable Iron Company. All pipes are in covered trenches.



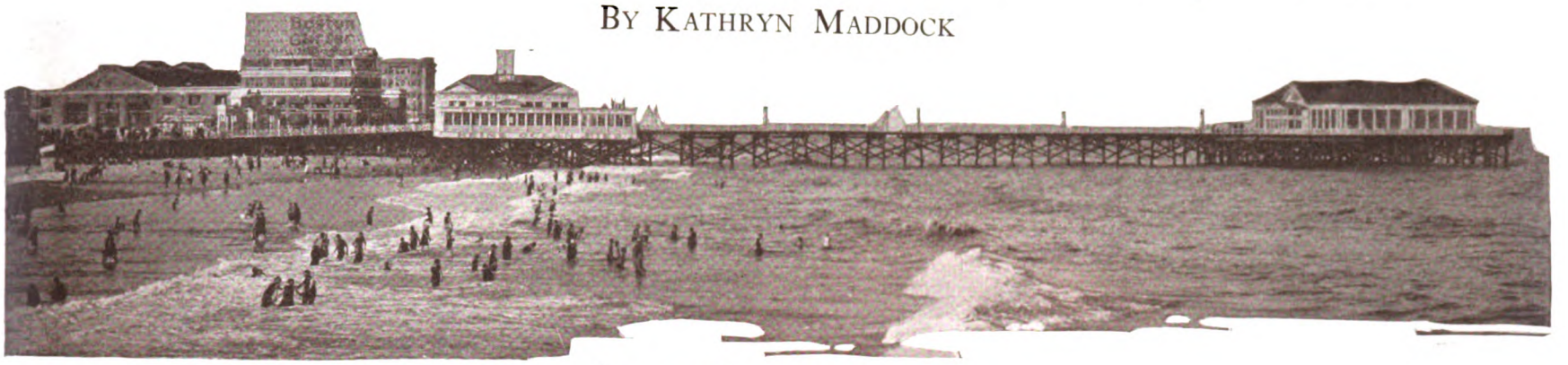
One of boilers at the Moline plant, showing piping from trench to burners under the boiler.

Digitized by Google

Oblique Methods Bring Orders

The Value of Displays that Do Not Attempt to Sell

By Kathryn Maddock



Heinz started "oblique selling" at Atlantic City thirty-five years ago, with one building which has since grown into a pier. Six thousand pickle customers flock there each day at the height of the season.



Just because they aren't expected to buy in this handsome shop, the perverse public gives it thousands of dollars worth of business every year.



There is no cash register in this shop, which nevertheless brings in rich returns to the Dupont Companies and to manufacturers who use their goods.

HIS selling equipment is not extensive, but he does have a baseball scoreboard to bring pennies his way, does Izzy, the little newsboy of capacious lungs who holds forth at the corner of the Plain Dealer building in Cleveland. He started it one day by scrawling the results, inning by inning, with a piece of chalk on the corner of the big granite building. It made a hit with the crowd that roots for Tris Speaker; he repeated it the next day, and the next, and the Plain Dealer folk, recognizing that it was a good newsboy venture, contrived him a sure enough bulletin board, with stylish lettering by a member of the art department, "Izzy Adler's Score Board," to take the curse of the chalk scrawls from off their good-looking building. Izzy says it pays.

Which is just another

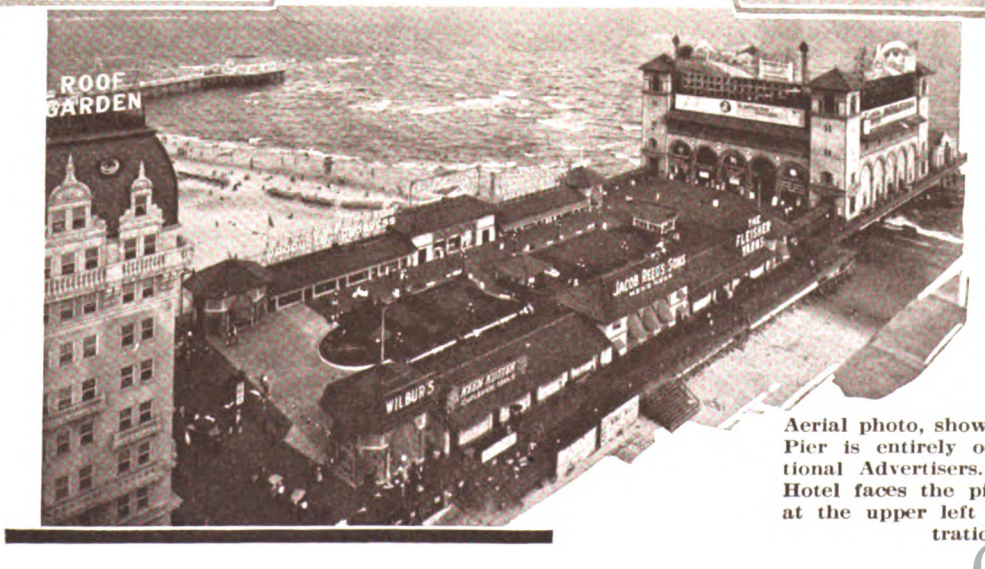
(*Continued on Page 28*)



Here the crowd stops to watch a cigar-maker at work, and hear him explain the process.



The newsboy with a baseball score-board sells more papers than his competitor with none.

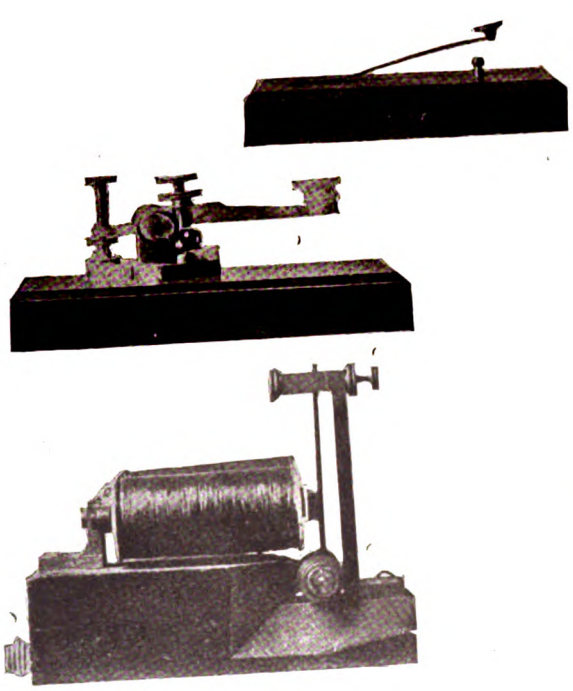


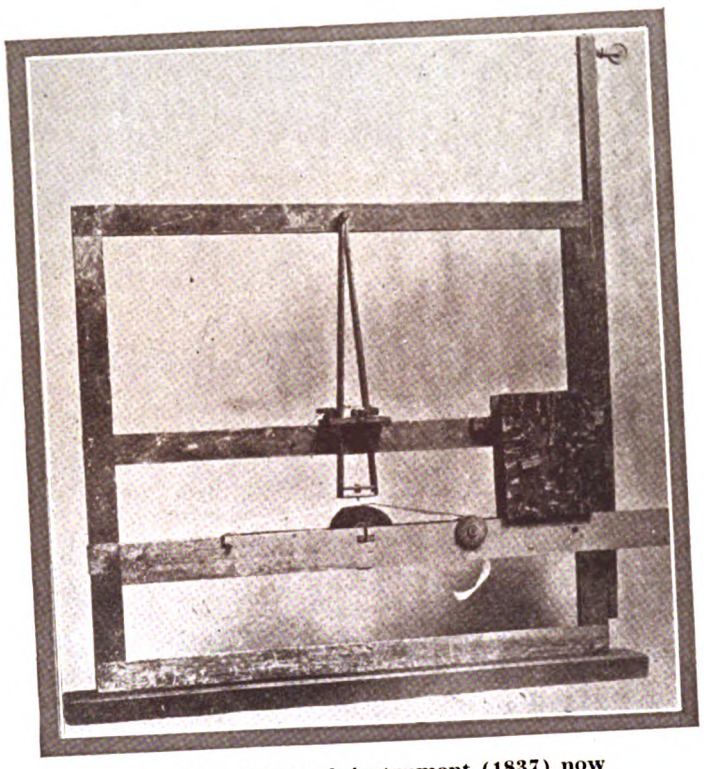
Aerial photo, showing how Garden Pier is entirely occupied by National Advertisers. The Breakers Hotel faces the pier. Heinz Pier at the upper left corner of illustration.

Digitized by Google

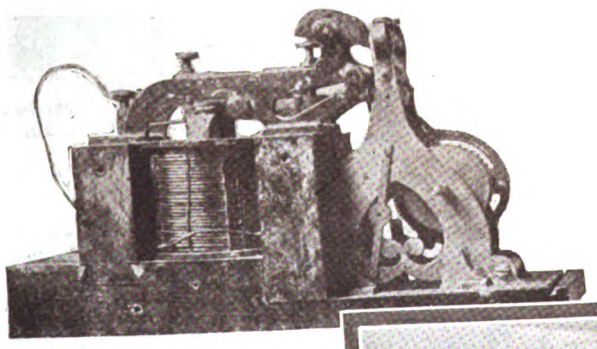
The Modern Telegraph--Its Methods and Operations

By H. W. Rustin





First telegraph instrument (1837) now in the National Museum in Washington. Its method of recording was comparatively simple. A pen attached to a pendulum, actuated by an electro-magnet, reproduced a series of long and short lines on a strip of paper.



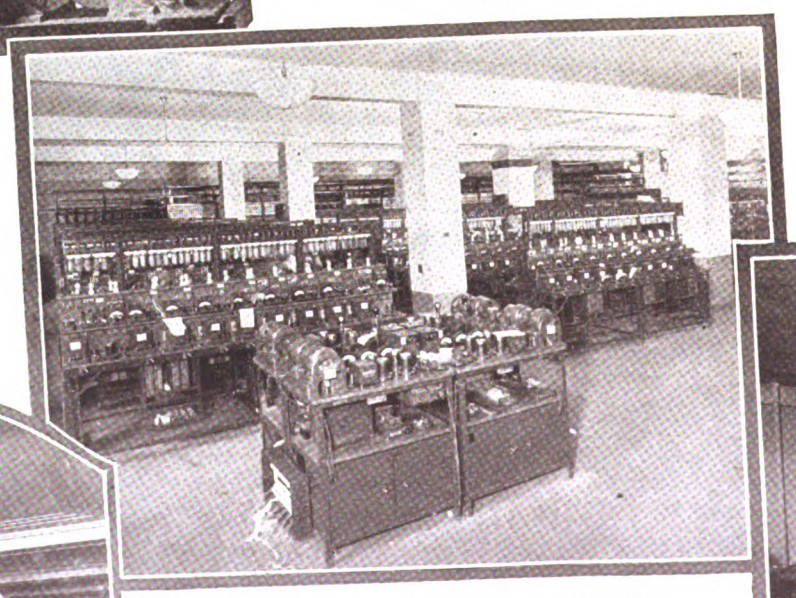
At the left are shown, in order: Early type of key, improved key, early form of relay—and the first Washington to Baltimore instrument.

SINCE the first practical demonstration of the telegraph by Samuel Morse in 1837 innumerable improvements have been made—but fundamentally the telegraph has not been changed.

As early as 1832 Professor Henry had invented a bell-telegraph, providing for the recording of messages by sound. The receiving apparatus was exceedingly simple, consisting of an electro-magnet the armature of which struck a bell.

Morse's invention superseded this and his first instrument, used on the Baltimore-Washington telegraph line, was self-recording, having a pen attached to a pendulum that was actuated by an electro-magnet and producing a series of long and short lines on a strip of paper. This was the Morse dot and dash code, which has remained in use ever since. About the year 1850 the form of the recorder was modified and the operators learned to take down the dots and dashes from the receiving instrument by ear, which is the present method of receiving messages sent in the Morse code by key and sounder.

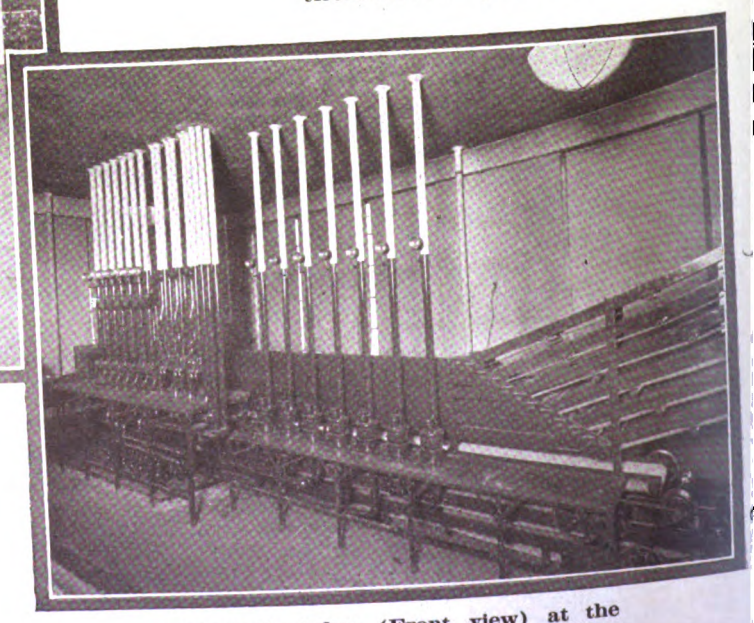
As the telegraph came into more general use numerous perplexing problems presented themselves—problems that re-



In the foreground can be seen the Rotary Repeater. In the background the Duplex Terminal used by testing and regulating attendants for the purpose of "lining up" duplex circuits.

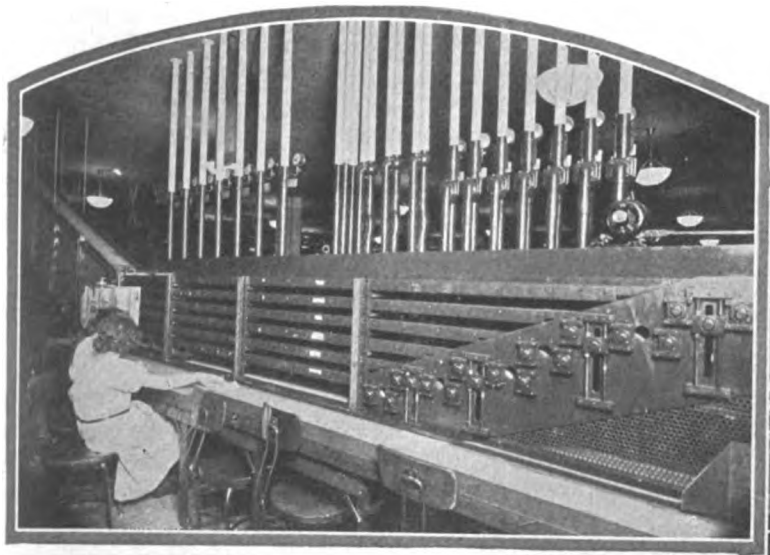


Messengers waiting to be dispatched for the pickup and delivery of telegrams.



Pneumatic tubes (Front view) at the Distributing Center. The messages are removed from the tube carriers by attendants and belted to their proper destination.

Digitized by Google



Above—Pneumatic tubes (rear view). The messages are removed from the conveying belt and routed and placed on one of the belts marked as A, B. C, etc.



Distributing Center in the Chicago Main Office.





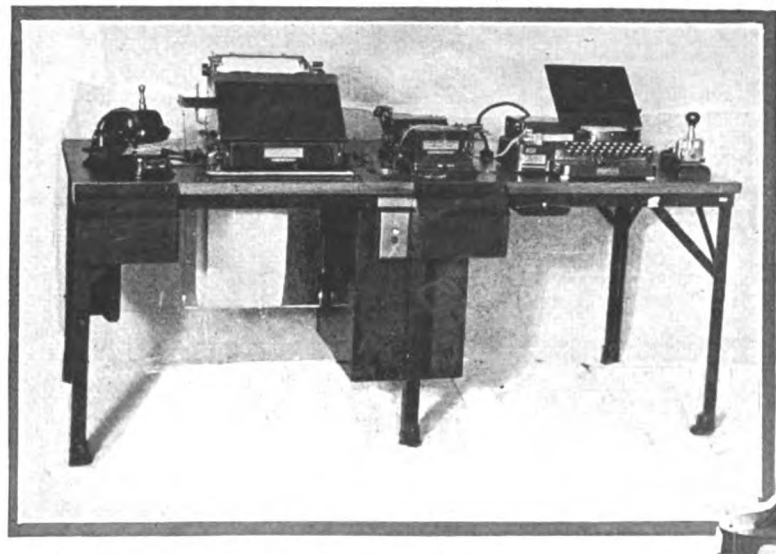
A closer view of the Multiplex sending apparatus—showing the perforator, the tape before and after the holes have been punched, and the mechanically-driven automatic transmitter.

quired a solution if the telegraph was to be a success commercially. The world's finest minds have bent themselves to cope with these and by a slow, step-by-step process eventually accomplished their purpose.

By the telegraph as invented by Morse only a single message could be sent over the wire at a time. As the volume of business increased, it was seen that a more complete utilization of the capacity of the line must be made, and this was accomplished by the introduction of duplex operation, and later of quadruplex operation, invented by Thomas A. Edison. The duplex permits two messages to go over the wire in opposite directions at the same time, and quadruplex, the passing of four messages going simultaneously over the same line, two in each direction.

Still further progress was made through the development of automatic transmitting and recording apparatus. The most recent and efficient invention of this kind is the Multiplex Printer System, which permits four operators to receive and four to send on each wire at the same time, thus increasing the capacity of the telegraph line eight-fold.

The simultaneous transmission of eight messages over the



Receiving and Sending apparatus of the Multiplex. On the right is the sending, showing the serial number stamp, a perforator and automatic transmitter. On the left the receiving with the Multiplex printer and Stromberg time and date stamp. Note the manner in which the blanks are fed from the continuous roll into the printer.

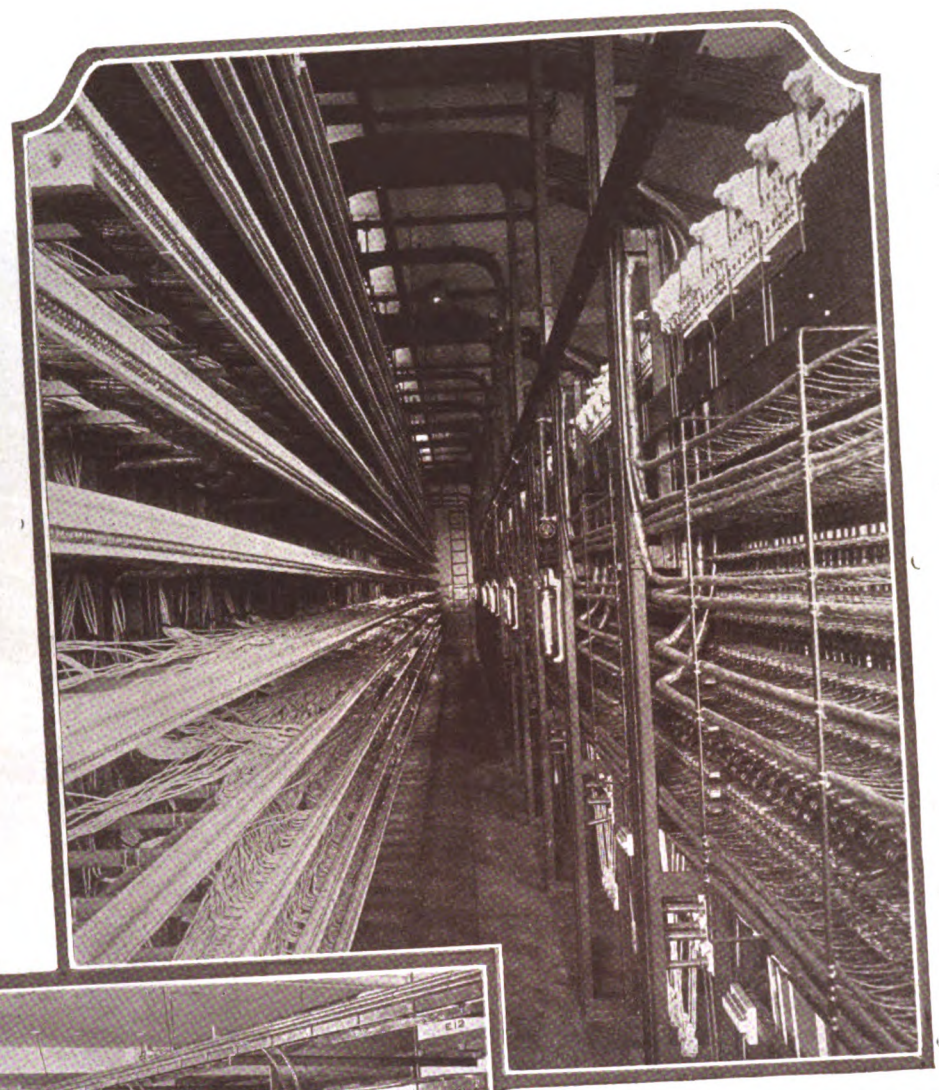


Comparing the tape with the message. Operator sending on the Multiplex.

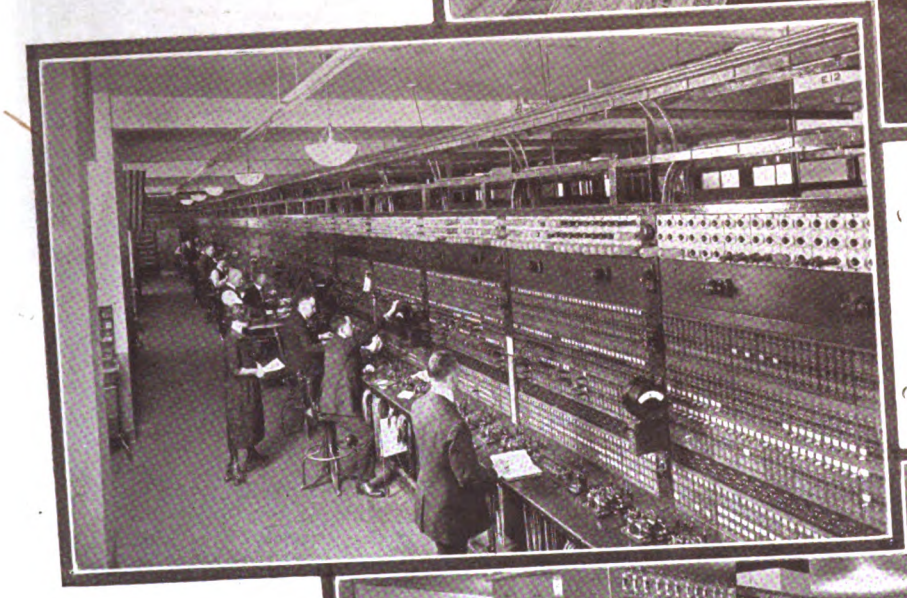
Digitized by Google



One of the standard types of clock used in furnishing Western Union Time Service.



Rear view of the switchboard in the New York main office—one of the busiest in the world.



Front view of the same switchboard is shown here at the left.

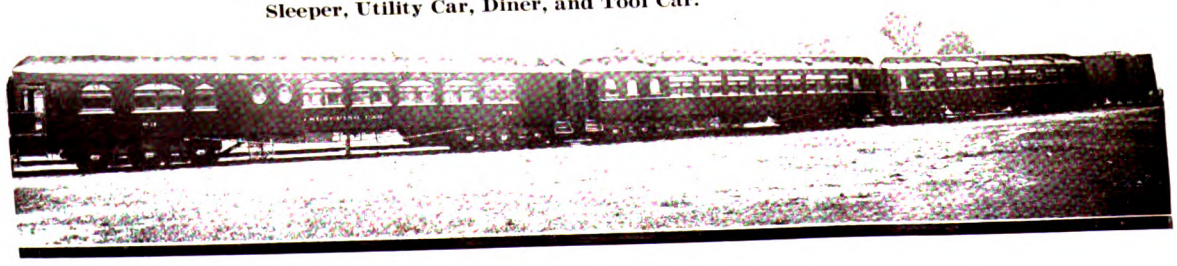


Testing room, where lines are tested by delicate instruments to locate breaks.



A typical repair gang. These are the men whose real job follows any severe storm.

A four-car camp outfit for repair gangs—Sleeper, Utility Car, Diner, and Tool Car.



same wire is made possible by apparatus, the principle of which can briefly be described as follows:

At each end of the line are two disks, that are divided into groups of segments insulated from each other. Each group of segments is connected to one of the sending and receiving machines. A rotating contact brush attached to the line wire passes over the disk and acts as a connection between it and the individual channels. The brushes at the opposite ends of the wire act in perfect unison as to position and time. What actually happens is that each receiving and sending set gets the use of the line for a minute fraction of a second in rotation.

The Multiplex Printer was an important factor in coping with the unprecedented expansion of traffic during and following the World War.

To maintain its wire system in constant working order and to make quick repairs in case of storm damage, the Western Union Telegraph Company maintains a mobile force of gangs, plant and equipment men. These are divided into floating units consisting of a foreman, from twelve to twenty men, cooks, and a camp-train consisting of a tool car, utility car, diner and sleeper. In cases of emergency these gangs, with their equipment, are ready at a moment's notice to be hurried to the place where they are needed, sometimes to another district where

Digitized by Google

trouble has arisen requiring more than the local force.

Modern industry is responsible for the great telegraph system that binds and links together the business of today. Fifty yars ago scores of small, privately-owned telegraph companies, charging high tolls and giving poor service, were in operation. In 1856 Hiram Sibley began the process of amalgamation by which these companies eventually were consolidated into the organization called the Western Union Telegraph Company. Today it has grown into one of the World's largest corporations. This Company employs over 60,000 people and operates some 26,000 offices. Its annual disbursement runs well over $90,000,000, approximately $68,000,000 of this being spent for the salaries of employees. It has been estimated that the copper wire in its lines if placed in one great coil would encircle the earth some 63 times.

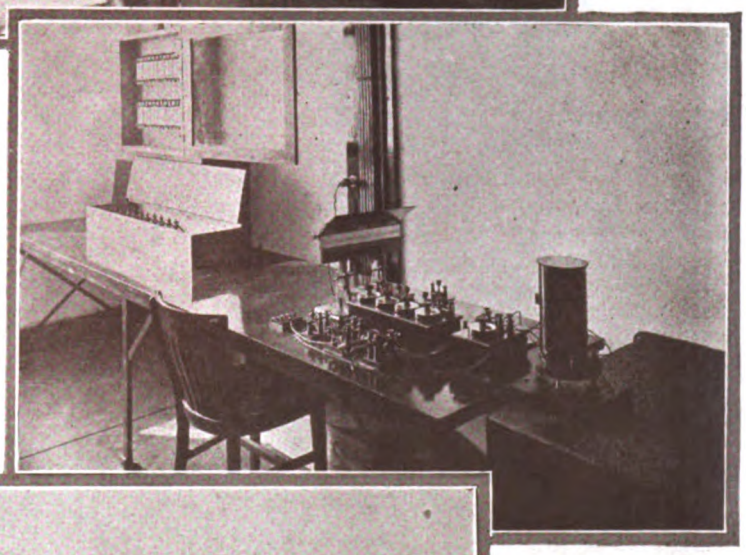
That the Telegraph Company today is a great corporation is true, but it is a corporation that keeps in personal touch with its employees, knowing that the element of human interest is a vital one. Its policy is one of coöperation and each and every employee in all its departments is working with one definite aim—for the elimination of the wasted second and to "Get the Message Through."

It may be interesting to trace the actual course of a single telegram—from the time it is handed to the messenger

(*Continued on Page 39*)



Part of the cable operating room at New York, where transatlantic messages are handled.



Cable testing instruments, for locating breaks, etc. By resistance-measuring, the break can be located within a few feet.





At the left—Picking up a cable by grapnel from the ocean's bottom.

The Cable ship "Lord Kelvin" is shown in the center panel.





At the left—The complicated gear for picking up cable at sea.

Below—"Laying in" sheathing wires over a newly spliced break in a cable.



At the left—Picking up a buoy which has been attached to cable.

Digitized by Google

The Making of Watch Crystals

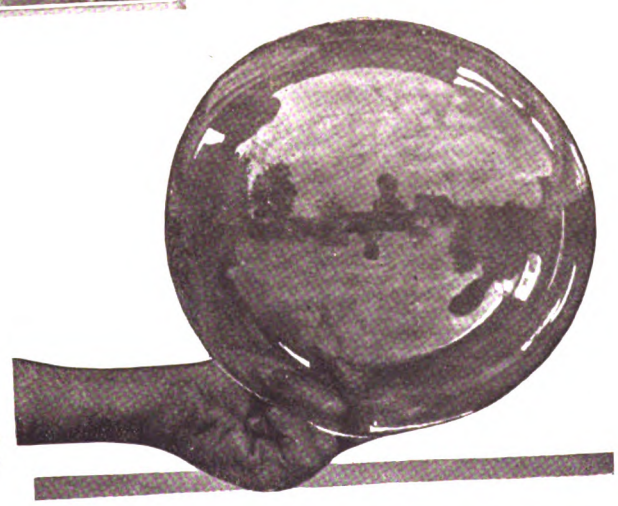
By W. H.



Glass Blowing Room. Furnace in left upper corner is the melting furnace; directly in front, a glass blower is seated on a bench forming a globe from which the crystals are cut. Furnace on right is where pots are preheated. A rack for holding the blown globes is shown on the floor at the right, containing several globes.



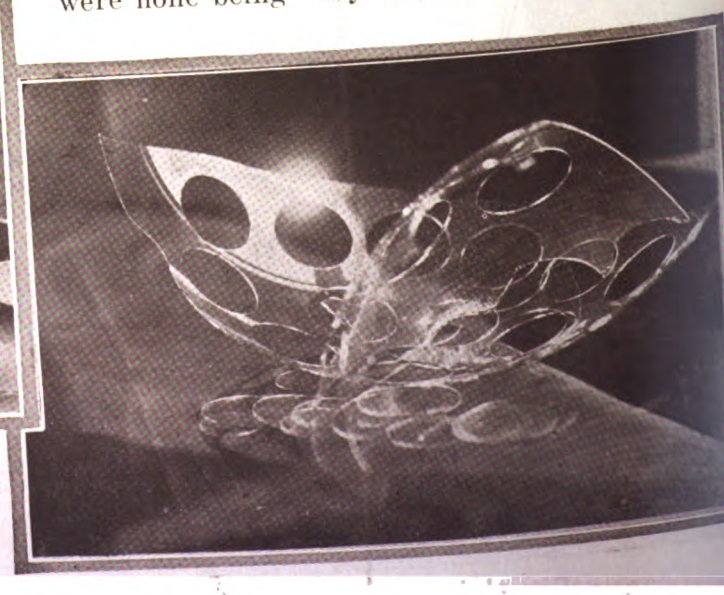
Cutting Room. The globes from which the crystals are cut are shown on the center cutting table. The globes shown are split in halves previous to cutting out the crystals.



A blown globe from which the crystals are cut. The photograph shows the high polish this globe takes from the fire.



Cutting out the crystals from the globe sections.



At the right—Sections of a half globe, showing crystals cut from them.

AT the outbreak of the war American watch manufacturers imported their watch crystals from Germany, France, Austria, Belgium, and Switzerland. The shutting off of imports found the watch industry of the United States in a bad position. Millions of dollars invested in watch plants, watchcase concerns, and the watch trade in general; thousands of workers in the manufacturing and jobbing trade; all affected by the lack of a small piece of clear glass that costs at the most a few cents. There was nothing that could take its place and there were none being made outside of the countries mentioned. It was up to the American watch manufacturers to either make the necessary crystals themselves or else tie up their plants until imports were resumed.

As a consequence several attempts were made to manufacture them on a commercial scale. They were unsuccessful. At this period, the Waterbury Clock Company, probably one of the largest users of watch crystals in the world, decided that they could and would manufacture watch crystals.

It was vitally necessary that these small circles of clear colorless glass, accurate, highly polished and free from all blemishes, should be manufactured in quantities and at a reasonable price. The first Ingersoll Watch carried a crystal made from a piece of common window glass, cut round and ground by hand. It is a far cry from that crystal to the

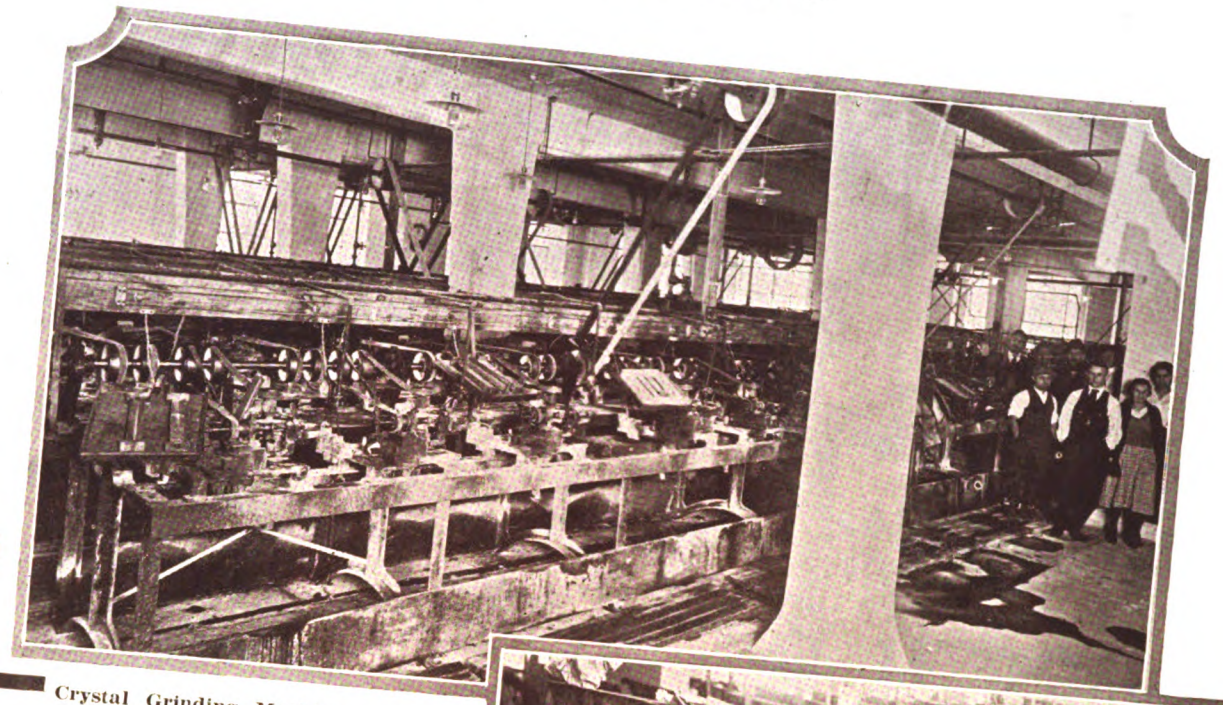
Digitized by Google

Now An American Art

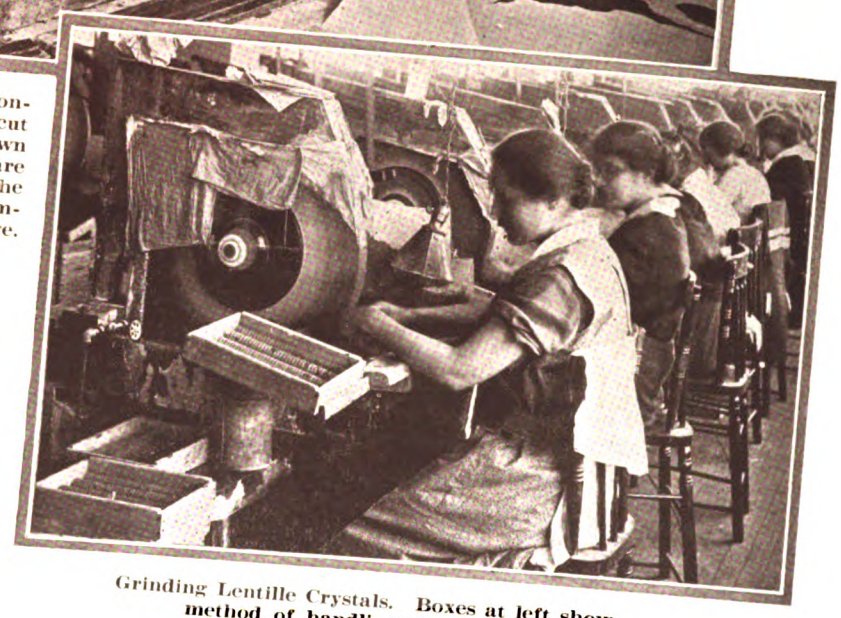
HOLMES



The American Watch Industry, employing thousands of hands, and representing millions of dollars of invested capital, is dependent upon a small piece of glass costing a few cents to manufacture.



Crystal Grinding Machines. Miconcave crystals, which are crystals cut from the half sections of the blown globes without further forming, are ground on this type of machine. The grinding brings them to correct diameter and forms the bevel on the edge.



Grinding Lentille Crystals. Boxes at left show method of handling the crystals.

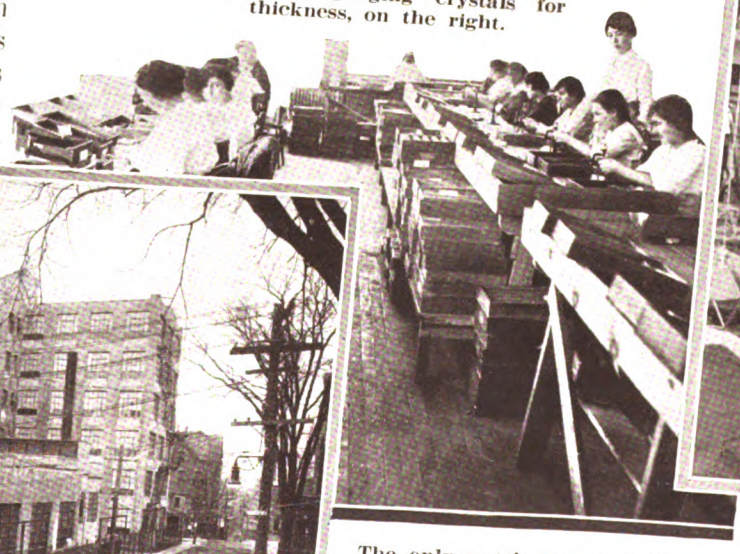
fine, perfectly formed crystals that are used on high grade watches today. One might say that the latter are as finely finished as a lens. To make these crystals was the task the Waterbury Clock Company undertook.

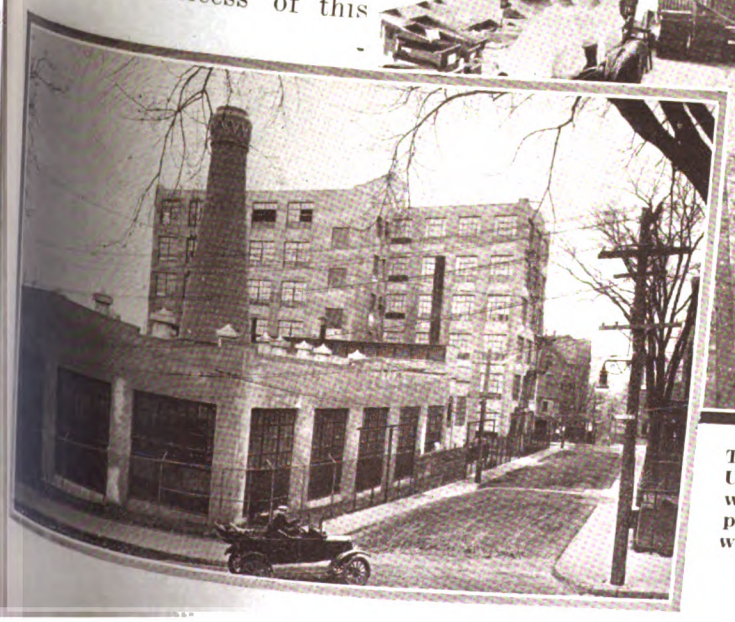
With their own needs in view and backed by the hopes of the industry in general they started this new industry. Without previous experience in this line, and handicapped by a lack of skilled help or the necessary machines, the concern succeeded in placing the manufacture of watch crystals on a sound commercial footing. This concern is practically the only one in the United States that is making crystals. It is producing goods that are fully equal to the imported goods, and is supplying other watch and watch-case manufacturers in addition to its own enormous wants. The success of this particular plant has made the United States practically independent of foreign countries for watch crystals, so far as the manufacturing is concerned. During the war, in a period when experimenting and "learning how" was the order of the day in this new industry, they supplied some 50,000,000 crystals to the trade.

However, the accomplishment was not without its obstacles. It took the Company several years, from a start where hand labor was employed almost exclusively for lack

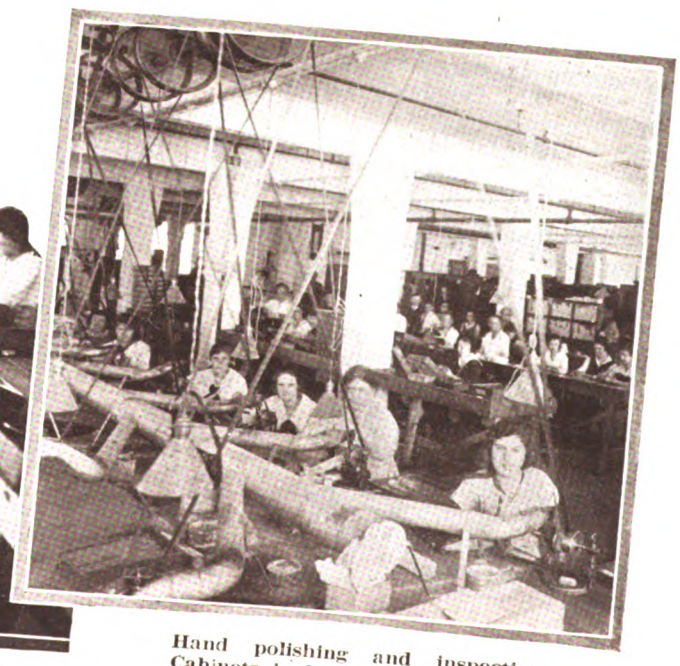
(Continued on Page 54)

Inspecting; gauging crystals for thickness, on the right.





The only watch crystal plant in The United States. Previous to the war all watch crystals were imported. This plant has a capacity of 800 gross of watch crystals a day, of all designs and sizes used in the trade.



Hand polishing and inspecting. Cabinets in back show method of stock keeping.

Digitized by Google

Music as an Aid to Industrial Teamwork

By B. S. Beach

AMONG the "by-products" of American industry, music must be given a prominent place.

A survey just made of half a dozen prominent big plants shows that along with the legitimate products of those establishments — machinery, tools, implements, goods of all kinds—there has also been given to the public in various ways a noteworthy array of bands, orchestras and choruses.

The industrial worker is frequently also a choral singer who needs only a little training to blossom into a creditable amateur; and he is now getting that training right in the plant where he is employed. Or he may be a versatile musician, fond of enlivening an hour or two of leisure in an informal program with other performers who do not stop to put off their overalls before taking up their instruments.

The case is even on record of a shop worker in a Pittsfield plant who has composed a "brass pipe quickstep." It is written, according to the score, in the key of "pipes"; and those who have heard it say it is a harmonious echo of the purr and whine of great machines in a modern factory.

Aside from the freakish element, however, there is a surprisingly well-developed musical undercurrent in the life of some of the best known industrial organizations, from which the public is gaining the benefit.

Citizens of Lawrence, Mass., were entertained through an entire summer by a complete brass band, composed of employees of the American Woolen Company. This band offered its services to the city, without charge or fee, and gave an acceptable program of concerts in the city parks.

They have a chorus of 200 voices at the plant of the National Cash Register Company at Dayton, O., which has given concerts at the Miami Valley Chautauqua entertainments before audiences of 2500 people; and the Stetson Chorus, of the John B. Stetson Company of Philadelphia, sings annually at the Christmas exercises at the Stetson plant to

(Continued on Page 30)



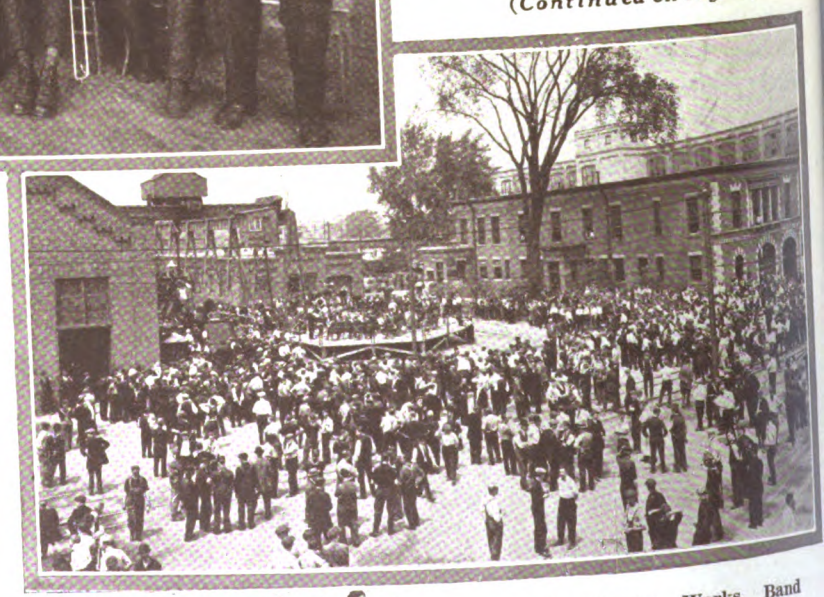
General Electric Company Band.

Below—Burgey's Orchestra. Industrial employees with musical talent form organizations of their own and play for both pleasure and profit.





Noon hour entertainment in a big factory yard to the accompaniment of a full band with the audience joining in the chorus.

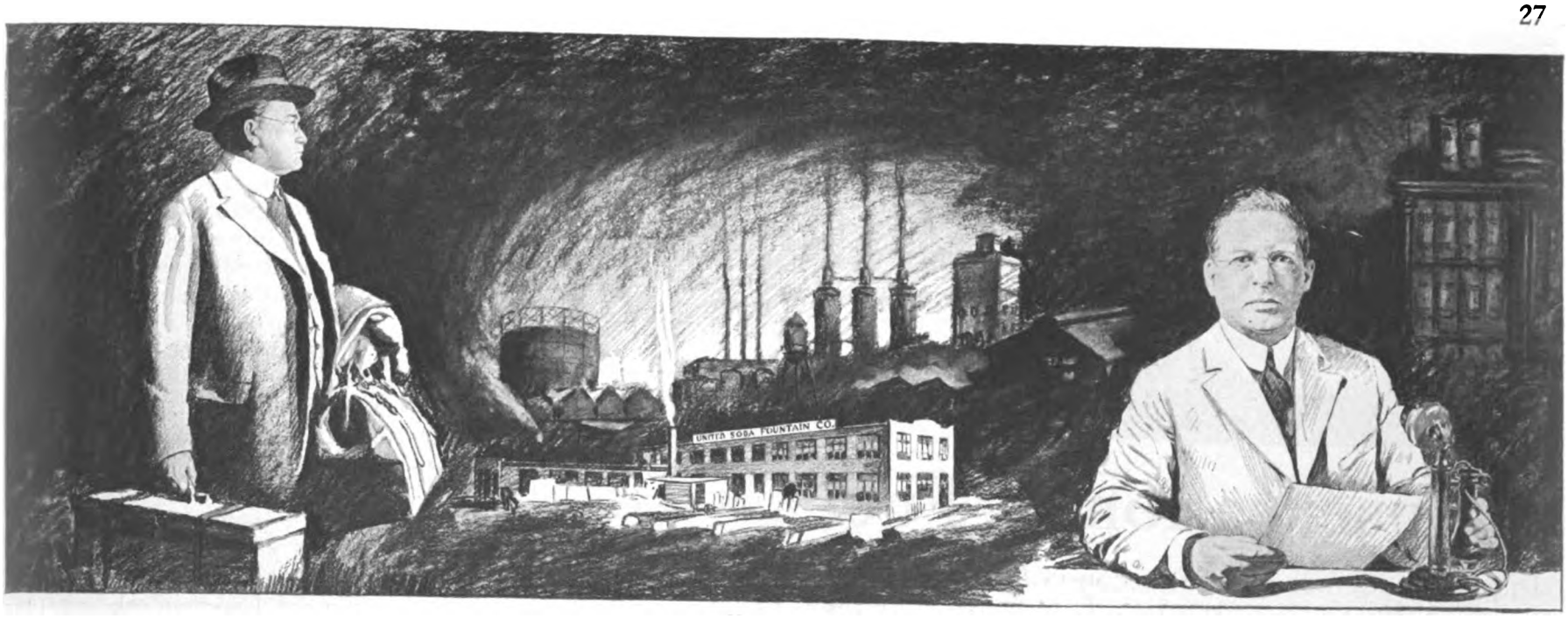


Schenectady Works Band giving noon concert for employees.



A Male Chorus, formed by one of the departments of a big manufacturing concern, which is in great demand.

Digitized by Google



In three short years he put it across

But he had dreamed about it for fourteen years. Haven't YOU dreamed long enough?

THIS is a story for salesmen; for accountants; for technical men—for any man who knows one department of business, and wonders how he is going to get to the top, either in the business where he now is, or in a business of his own.

It has to do with a man named R. Lee Smith, now Vice-President and General Manager of the United Soda Fountain Company of Boston; one of the most successful concerns of its kind in the country.

For fourteen years he worked and dreamed; then he added the training of the Alexander Hamilton Institute to his work.

And in three short years had made the dreams of fourteen years come true.

Thirty-eight; married; and a family

Starting as a salesman he became salesmanager of a company making soda fountains and their equipment. He was successful in his department—sales. (Most men who enrol with the Institute *are* already successful in the one department of business where their experience has been gained.) He was thirty-eight. (Most men who enrol with the Institute are between twenty-five and forty-five.) He was married (A majority of the men who enrol with the Institute are.)

And *this* was the driving power behind his decision: "I wished to afford my family advantages," he wrote, *"which otherwise they would not have had."*

"I had dreamed for years of my own business"

"For fourteen years I had been a salesman and salesmanager," he continued. "I had dreamed for years of my own business organization but my work gave me no understanding of business other than that which concerned selling. *I knew nothing of production, financing, or business promotion.*

"Your Course and Service gave me an understanding of these things."

He clipped a coupon from an advertisement like this. With the knowledge which the Institute brought to him, and with its encouragement and guidance, he organized the United Soda Fountain Company, erected a factory and started production. Straight thru the period of business depression the business has steadily grown; and now Mr. Smith plans to double its factory space and its output.

So three years work *with training* did what work alone had never been able to do.

A book that has made dreams come true

You who read Mr. Smith's story on this page are already familiar with the Alexander Hamilton Institute. You know how many thousand men there are who, like Mr. Smith—give it credit for having shortened their path to larger income and greater success.

The whole story of the Institute has been printed fully in a 118-page book—a book that should be in every thoughtful man's library. It is called

"Forging Ahead in Business"

For any man who is asking himself "Where am I going to be in business ten years from now?" there is a copy of this book without obligation. We would like to place it in the hands of *every* ambitious man. It helped Mr. Smith to give his family "advantages that otherwise they would not have had." Send for your copy now.

Alexander Hamilton Institute
596 Astor Place, New York

Send me "FORGING AHEAD IN BUSINESS" which I may keep without obligation.

Name.....
Print here
Business Address.....

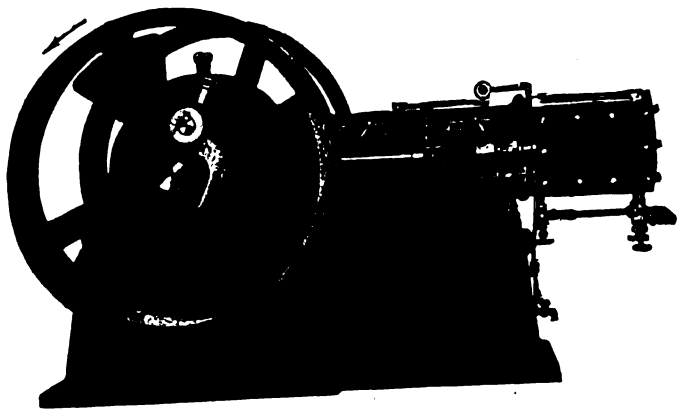
.....

Business Position.....

Canadian Address, C. P. R. Building, Toronto; Australian Address, 42 Hunter Street, Sydney

Copyright, 1922, Alexander Hamilton Institute

Digitized by Google



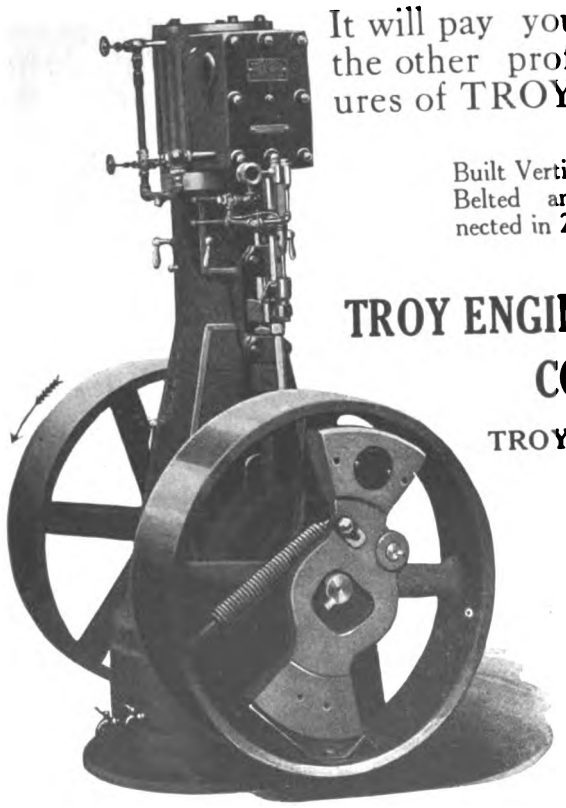
Conservation of Fuel

Important factors today in economic boiler operation are the small auxiliaries that propell the fans, stokers, blowers, and other boiler room equipment.

The fuel scarcity and high prices make fuel conservation absolutely imperative if the cost of power is to be kept at the minimum.

TROY Engines have always helped towards lower power costs by giving *greater brake horse power with the same steam consumption.*

The exclusive TROY System of Automatic Lubrication supplies an abundance of oil to all parts subject to friction, keeps bearings clean and reduces wear.



It will pay you to investigate the other profit making features of TROY Engines.

Built Vertical, Horizontal, Belted and Direct-Connected in 2 to 200 B.H.P.

TROY ENGINE & MACHINE COMPANY

TROY, PENNSYLVANIA

Send for descriptive literature

TROY ENGINES

ONLY STEAM ENGINES GOOD ENGINES ONLY

Oblique Methods Bring Orders

(Continued from Page 19)

instance to prove the principle that added attractions in the way of entertainment or information make sales for the merchant. Izzy has given the stamp of his approval to the policy which John Wanamaker believed in when he installed a pipe organ in a department store. It's a principle which is not applied nearly so widely as it might be.

There are probably more examples of this sort of merchandising at Atlantic City than anywhere else in the country. Here, where people come by the millions for amusement, where the fakir and the side show vie with the wild waves and the bathing suits for people's attention, a number of manufacturers find it profitable to maintain, not retail stores, but merchandising exhibits, better suited to meet the holiday mood of the crowd than is the ordinary shop. Folk may drop in and rest in these display rooms, look at the products on view, see a movie or hear a lecture of interesting and informative character, and ask all the questions they wish, without feeling the slightest obligation to buy. Needless to say, they do buy, just because they aren't asked to, and their purchases run up into large figures, which, in addition to the inevitable publicity resulting from exposing thousands of good potential customers to their products, accounts for the interest of the Duponts, the American Tobacco Company, Heinz, Gainaday, and any number of electrical manufacturers and others in these displays.

It might seem that the minstrel shows and the boardwalk and the beach parade would offer pretty strenuous competition for the merchandising exhibit, but the fact is that people who come to Atlantic City to stay for even a few days, after a bit of frivoling feel the desire for something substantial again. They revert to type, so to speak, and the Heinz Pier, the Crosby and Elkins showing of the marvels produced nowadays in the electrical world, the "place where they make cigarettes" on Garden Pier, and the other exhibits of similar sort afford just the relief from the jazz that people seem to want, without bringing them back to their own serious business again.

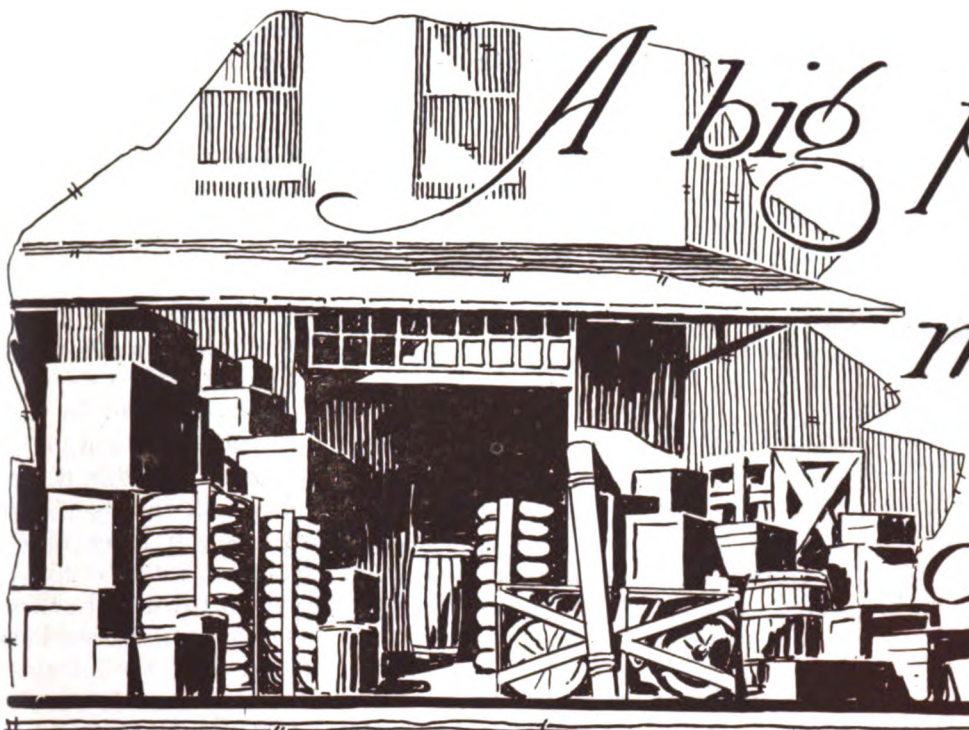
There are a dozen or more such exhibits about the boardwalk, with every once in a while an "industrial exposition" held for a short period. Heinz started the thing thirty-five years ago, with one building, which has since grown into a pier. He had movies there fifteen years ago, when movies were a novelty, to say the least. Besides the pictures and lectures on how the fifty-seven varieties are made, and the demonstrations by ladies in white caps and aprons about how to use the various pickles and jams and sauces, he exhibits to the curious public something more than fifty-seven kinds of art objects picked up in all parts of the world, from marble busts of John Wesley to Buddhist household shrines and ferocious embroidered lions. And people flock there at the rate of 6000 a day in August when the weather is good.

One pier down the beach from Heinz (to use Atlantic city parlance) the Lucky Strike people are making cigarettes and selling them to the crowd fresh toasted. Fifteen employes are kept busy here during the summer months, serving an average of 4,000 people daily. The Pennsylvania Rubber Company strikes a different note in regarding its display quarters as a "high class rest room" for the public. The Dupont Company has an exhibit covering nearly 5000 square feet of floor space, in which there are shown not only the explosives, chemicals, paints, varnishes, and other products as they are made by this company, but also goods of all sorts, from traveling bags to pictures frames, in which other manufacturers make use of Dupont materials.

"A tremendous volume of business originates as a result of this unique method of sales promotion," said Mr. Daniel J. O'Connell, manager of the Dupont display. "Not only our own company, but also all the other manufacturers and all the dealers who handle these goods profit by it. We are constantly making new customers and turning their inquiries over to

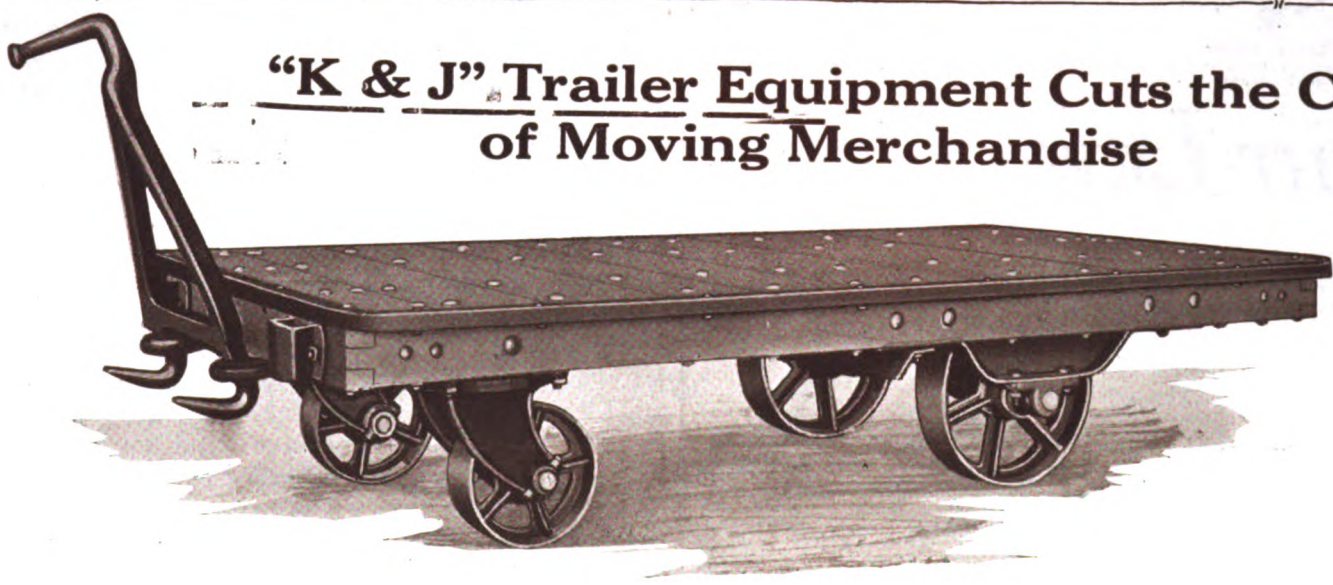
(Continued on Page 30)

Digitized by Google



A big part of the cost of merchandise is the cost of moving it.

"K & J" Trailer Equipment Cuts the Cost of Moving Merchandise



A good deal of "grief" resulted before motor truck users learned that converted passenger cars would not make successful motor trucks.

May trailer users never have to go through the same experience regarding hand trucks and trailers.

The "K&J" Organization produces both the hand truck and the trailer, each the best of its class, but in distinctly different classes.

One of several "K&J" Standard Trailers is shown here. This is a two ton type, platform length, 6 ft., width, 3 ft., height, 14 inches, wheels equipped with Hyatt Roller Bearings, approximate weight of trailer, 4000 lbs.

Many types of "K&J" Standard Trailers are offered or special designs will be furnished to meet special conditions.

Hyatt Roller Bearings are standard equipment on all "K&J" Standard Trailers.

Get Bulletin No. 510

TRADE MARK

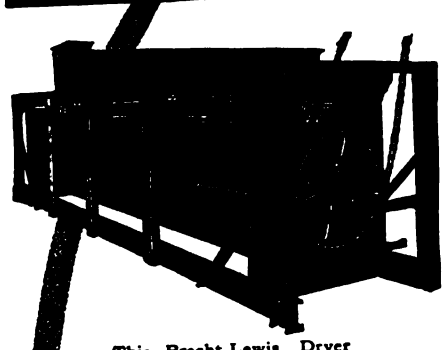
THE SEAL OF SATISFACTION K&J REG.

The Kilbourne & Jacobs M'f'g Co., Columbus, Ohio, U. S. A.

New York Offices, 120 Broadway

Digitized by Google

Solving Your Drying Problem



This Brecht-Lewis Dryer turns out greater volume—faster, better and cheaper.

MANY drying problems vanish with the installation of a Brecht-Lewis Dryer. Greater volume, more perfectly dried product, and with lower steam consumption and H.P. used—that is the remarkable accomplishment of this new departure in dryers which can be operated either as a batch or continuous dryer at a saving over other systems.

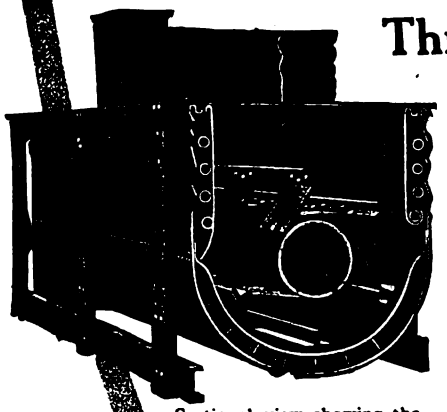
BRECHT-LEWIS DRYER

(PATENTED)

The Brecht-Lewis Dryer opens a new era of economy in the drying of all materials of a loose, shredded or granular nature. Successfully handles:—

Apple Pomace
Alfalfa Meal
Beet Pulp
Bagasse
Bone
Carbonates of Lime, Potash or Soda
Cereal Products
Chalk
Charcoal
Clays
Coal
Coffee
Copra
Cork Chips
Cotton Seed Meal
Fish Scrap
Garbage
Grains
Graphite
Gravel
Gypsum
Kaolin
Leather Scrap
Lime
Marl
Metal Chips
Nitrate of Ammonia
Nitrate of Potash
Packing House Products
Peanut Hulls
Peat
Phosphate
Pumice Stone
Rice
Salt
Sand
Sawdust
Silica
Soapstone
Sugar Refuse
Talc Rock
Tobacco Stems
Whiting, and many other materials

Three Dryers In One!



Sectional view showing the improved method of heating and agitating—the secret of this dryer's efficiency.

This new design is really three Dryers in one; a combination of direct and indirect heat dryer allowing heat control from three sources—

1. From the steam drum,
2. From the jacketed bottom,
3. Hot air forced in from the side coils,

and is therefore adaptable to materials requiring either high or very low temperatures.

Hot air under pressure carries away the released moisture without recondensation.

Write for FACTS!

THE BRECHT COMPANY
1219 Cass Ave. St. Louis, Mo.

Branches:

New York, N. Y.
Chicago, Ill.
San Francisco, Cal.
Liverpool, Eng.
London, Eng.
Cape Town, S. A.
Buenos Aires, A. R.
Madrid, Spain
Shanghai, China
Mexico City, Mex.
Sidney, N. S. W.

The Brecht Company,
1219 Cass Ave., St. Louis, Mo.

Please tell me, without obligation on my part, how the Brecht-Lewis Dryer is adapted to my business, and how it will effect economies for me.

Quantity of material to be dried daily .....

Percentage of moisture in mixture .....

Percentage of moisture to be removed .....

Firm Name ..... Address .....

Attention of ..... Title .....

(Continued from Page 28)

retailers hundreds or thousands of miles away to make the sales."

Goods are sold at the exhibit only on request, but names and addresses of prospects are sent to local representatives all over the country.

This is also the arrangement of the Crosby and Elkins Company, which displays electrical devices in a handsome Garden Pier show room for a number of manufacturers. People drop in casually, to see what there is to see, and perhaps to ask a specific question, and they stay to gossip about things electrical, and sooner or later to give an order, or intimate that they may wish to do so soon. None of the leads they drop are lost on Mr. Benjamin S. Crosby, who sends a post-haste report to the "home town" dealer to follow-up. A big manufacturer who came in one day, for instance, sat and talked for two hours about electric furnaces, arranging, before he left, for further consultation on the subject at his own office in Pittsburgh. As they parted, Mr. Crosby asked him, "How much chance would a manufacturer's representatives have had to see you for this length of time at your desk?" And the executive smiled. "They've been trying to for years," he said.

Women come in and bring their knitting and stay all morning in this pleasant parlor overlooking the beach, and then when they go home they write back and order an ironer or a washer—one even sent all the way from Spokane for so small an item as an electric grill, apparently thinking that this was the only place in the world to buy one.

And Mr. Crosby has carried the exhibit idea a step further and proved its value as a merchandising method in other communities, where the unusual conditions of Atlantic City do not obtain. In eight or ten small Jersey towns surrounding the resort, he runs electrical departments for hardware dealers, furniture dealers, and others who do not themselves have the technical knowledge of the appliances. He sets up a merchandising exhibit in each shop, and instead of employing a trained salesman for it, lets the display talk for itself, and puts out a small force of expert electrical men to flivver from town to town and call on propects whose inquires have been noted by the dealers. These men demonstrate and close sales, and supply what instructions and servicing may be necessary for satisfactory operation of electric appliances.

The success of the experiment shows that the idea of the merchandising exhibit might well be utilized more generally by merchants. For this oblique sales method brings results. It puts people in a more generous frame of mind, by reason of the fact that you are giving them something free, and not hounding them to buy. The meeting of salesmen and customer in the usual store is likely to be an encounter of wits in which the prospect is instinctively on the defensive. But if you are merely dispensing useful information, or inviting the caller to be your guest and see a demonstration of an interesting industrial process, then the customer feels appreciation of your liberality and is likely to respond with a loosening of purse strings. Izzy, the newsboy, and John Wanamaker, the merchant, knew what they were about; the folk at Atlantic City have abundantly proved the soundness of their judgment.

Music as an Aid to Industrial Teamwork

(Continued from Page 26)

say nothing of its annual spring concert for the benefit of the Stetson Hospital.

Bands of the General Electric Company regularly led Liberty Loan parades in Schenectady, N. Y., Pittsfield, Mass., Erie, Pa., and Fort Wayne, Ind. In each of these places no great festival or procession occurs without the prominent participation of the G-E bands. The G-E chorus and glee club at the Erie works gave a minstrel performance in one of the theatres on one

(Continued on Page 32)

Digitized by Google



WHY MEN CHANGE TO ALLIGATOR

Strength comes first in belt lacing. Then follow: durability, ease and speed of application, efficiency in service, range and economy.

Alligator is the Strongest Belt Lacing on Earth —and the most permanent. It is applied with a hammer in an average time of only three minutes.

Mechanically perfect because it binds the long burden bearing belt fibres in equal service. "Every Tooth A Vise." Rocker steel hinge pin endures in any service where the belt will run. The finished joint is flexible, separable and smooth on both sides.

There is a size for every thickness of belting and the price is so reasonable that **its use immediately becomes an economy.**

Sold through "Jobber Dealer" trade channels the world over.



The strongest belt lacing on earth.

"Never Lets Go"

If you are not using Alligator now, write us for sample and our interesting book "Short Cuts to Power Transmission." A trial of Alligator will be no less convincing than an analysis of its points.

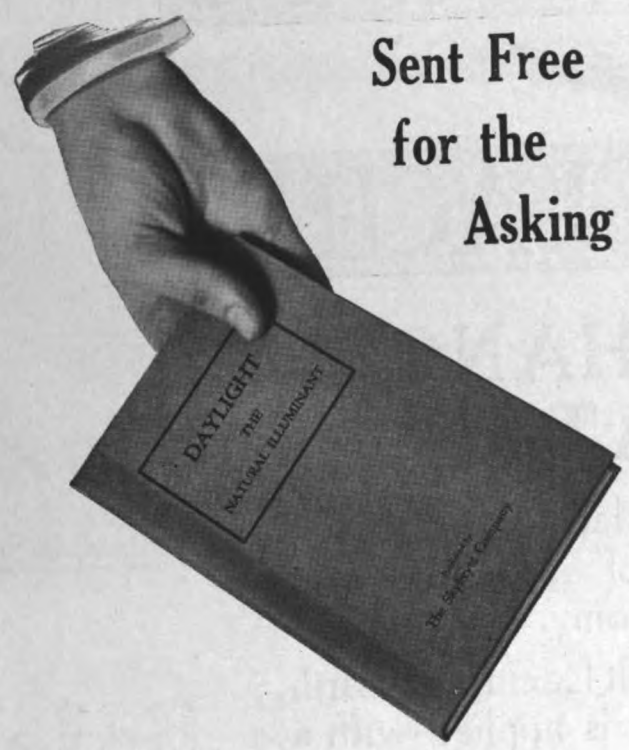
Flexible Steel Lacing Company

4639 Lexington St., Chicago, Ill.

In England at 135 Finsbury Pavement, London, E. C. 2.

Digitized by Google

NOW READY!
"A Scientific Treatise on Natural Light"



Sent Free for the Asking

The first and only book on this subject ever published

THIS book explains what daylight is and points out its advantages and economies in plant operation.

It shows, and tells why adequate illumination decreases accidents and spoilage, increases production, stimulates the workman, makes him more cheerful, and safeguards his health.

The material in this book has been compiled after years of actual tests, experiments, and research work by the Skybryte organization; by exchange courtesies with the greatest laboratories and experiment stations in the world; and by foremost lighting experts of today.

This book contains a wealth of information heretofore unavailable.

It reveals the great waste due to neglect of natura lighting equipment.

It shows how greatly to increase the production of any plant.

It is of inestimable value to any industry.

This book, which has cost us thousands of dollars to prepare, will be sent free to those in authority in industrial plants. Just write your name and title on coupon below, attach to your letterhead and send to—

THE SKYBRYTE CO.
317 Bangor Bldg. Cleveland, Ohio

SKYBRYTE
FOR MAXIMUM DAYLIGHT

The Skybryte Co.: Please send me, free of charge, a copy of "A Scientific Treatise on Natural Light,"

Name _____

Title _____

Company _____

Address _____

(Continued from Page 30)

occasion, the affair becoming a city-wide musical event.

Weekly noon band concerts are a feature of life at the Schenectady plant of the General Electric Company. In one of the departments that employs a number of girls, the G-E- Choral Society is a well established institution. There is also a Switchboard Male Chorus and a General Engineering Laboratory Orchestra in this musically inclined plant.

The glee club of the Eastman Kodak Company, of Rochester, N. Y., not only appears at concerts in that city, but in many nearby towns as well. And the Winchester Repeating Arms Company of New Haven, has just opened its Winchester Girls' Clubhouse with an attractive concert, by plant talent, the beginning of a large season of affairs by the industrial songsters.

One motive lies back of practically every one of these shop musical organizations. It is the desire to drive away monotony and to keep it driven away.

In these days, the break in the working day which comes at noon is something far more than a mere listless, idle, purposeless hour or half hour. It is a time of real rational recreating of the spirits. Every day, almost, noonday concerts or snappy, compressed entertainments, are going forward in dozens of big industrial plants with a regularity and wideness of scope equalled only by the multitude of welfare entertainments given for the soldiers in the army camps during the war.

A visitor to one big plant described these affairs in these words:

"Shortly after the noon whistle blows, an orchestra or chorus or soloists, of local talent, suddenly makes an appearance in the midst of one of the great shops. A cover is lifted, and behold, there is a piano, incongruously kept amid the weird electric machines being assembled on all sides. A fifteen to twenty five minute concert is held, the whistle blows, both the musicians and audience go back to work, and, like magic, the music of the volunteer entertainers is replaced by the great indescribable song of American industry.

"After one of these entertainments I asked the foreman how the piano came to be there, and he replied:

" 'Each employee on this floor put in a penny a day for one month, and that paid for the piano.' "

In this particular plant, one of the General Electric Company's works, there are nearly 50 pianos in the shops, and a dozen phonographs.

Four bands, half a dozen glee clubs and choruses, and several orchestras and drum corps are in existence among the various factories of this company. The bands as a rule are managed by professional band leaders, and are maintained by the company. But many of the other musical organizations are the creation, and are under the sole management, of the employees.

Swift & Company has two musical organizations of high caliber. The first is its male chorus; the second is the noted Swift Military Band.

The male chorus made its first public appearance in May 1918. Since then it has given nearly forty concerts. It has sung many times in Chicago's churches and has raised large sums for church and charitable objects. The director is D. A. Clippinger, who is credited with having made this chorus what it is today.

As for the Swift Military Band, it is rated as one of the best known instrumental organizations in Chicago. There are about 75 well trained musicians, all of them employees by day in the offices and plant of the company.

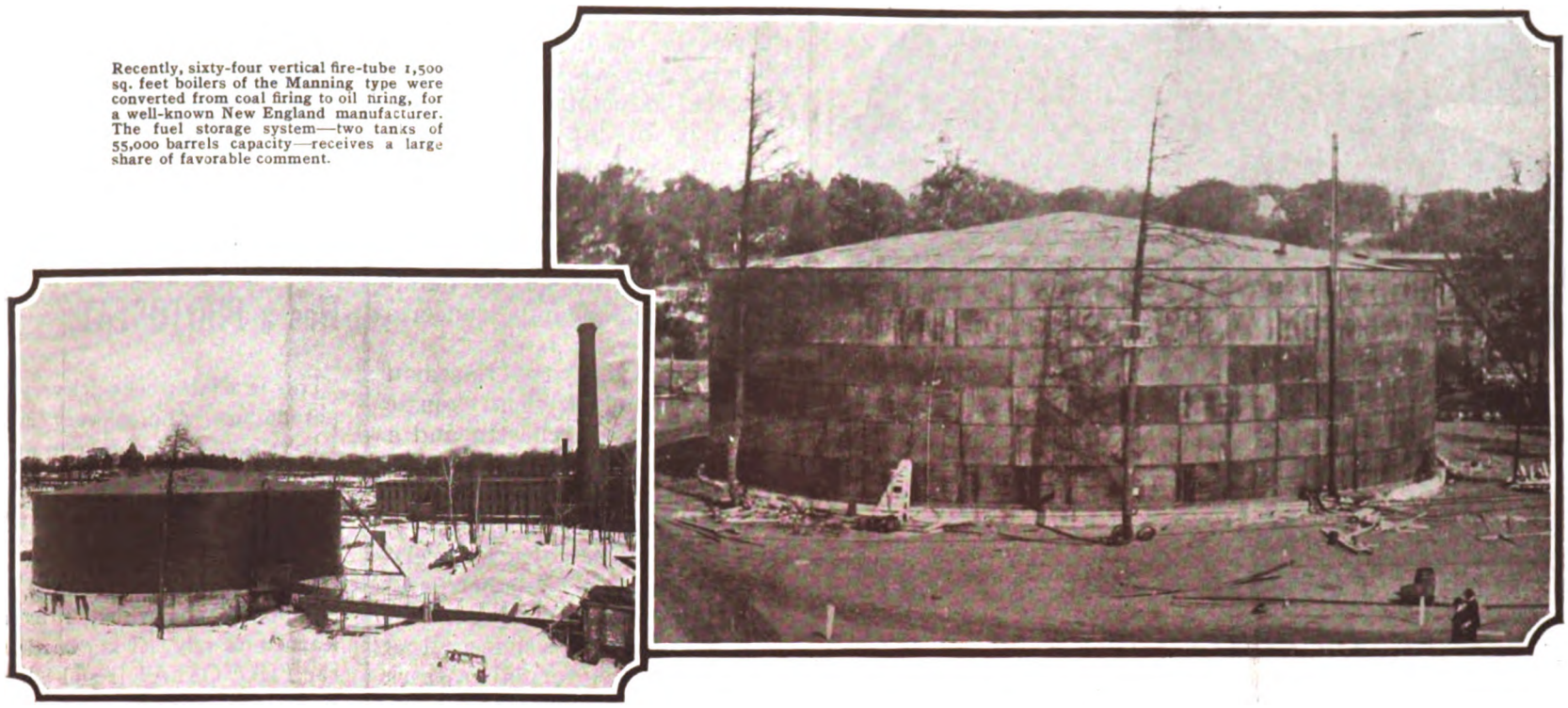
This band appears in public about forty times a year on an average. Concerts, parades, dances, open-air festivals and exercises are the principal events. Several out-of-town trips have also been made. Clarence Clark is the band leader.

According to E. L. Ward, office manager of Swift & Company the band has been one of the factors in forming the splendid spirit that exists among Swift & Company employees.

A brass band, and a jazz band in the factories of the American Woolen Company at Lawrence, Mass., are con-

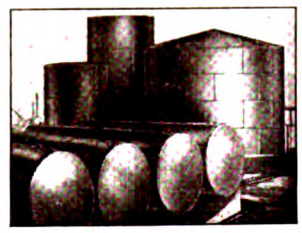
(Continued on Page 34)

Digitized by Google



Recently, sixty-four vertical fire-tube 1,500 sq. feet boilers of the Manning type were converted from coal firing to oil firing, for a well-known New England manufacturer. The fuel storage system—two tanks of 55,000 barrels capacity—receives a large share of favorable comment.

Lancaster Tanks Help Make 64 Boilers Independent of Coal





THIS installation is typical of Lancaster workmanship. The fact that we are Tank Specialists is an important fact to you in these days of fuel worries. When you meet—for any reason—the problem of changing over to oil fuel, it is good for you to know that you can secure the maximum in Tank Engineering Service. It is good for you to know that Lancaster Iron Works has fabricated thousands of tanks for every storage purpose and that those Tanks are standing sturdy and strong because they were not only made right but designed right. They are designed right because our specialized experience gives us the ability to specify just what kind of tank is needed—how big and how heavy for any particular storage need.

Ask our Lancaster, Philadelphia or New York office to send a Lancaster Engineer to you. He will tell you how much fuel you should store, where best to store it, how many tanks are necessary. He will recommend the best tank for the purpose. That is part of what we mean by Lancaster Tank Engineering Service.

We have three very important books that are packed full of concentrated Tank information. They contain the boiled down results of twenty years' experience in fabricating Steel Tanks for every purpose. Any or all will be sent free upon request.

Book B-1	List prices and specifications on 303 sizes of Horizontal Storage from 100 to to 25,000 gallons capacity.
Book B-2	Storage Tanks, sizes from 1,000 to 74,000 barrels capacity.
Book B-3	List Prices and Specifications of 134 Standard Sizes of Pressure Tanks

✳ ✳ ✳

LANCASTER IRON WORKS, INC.

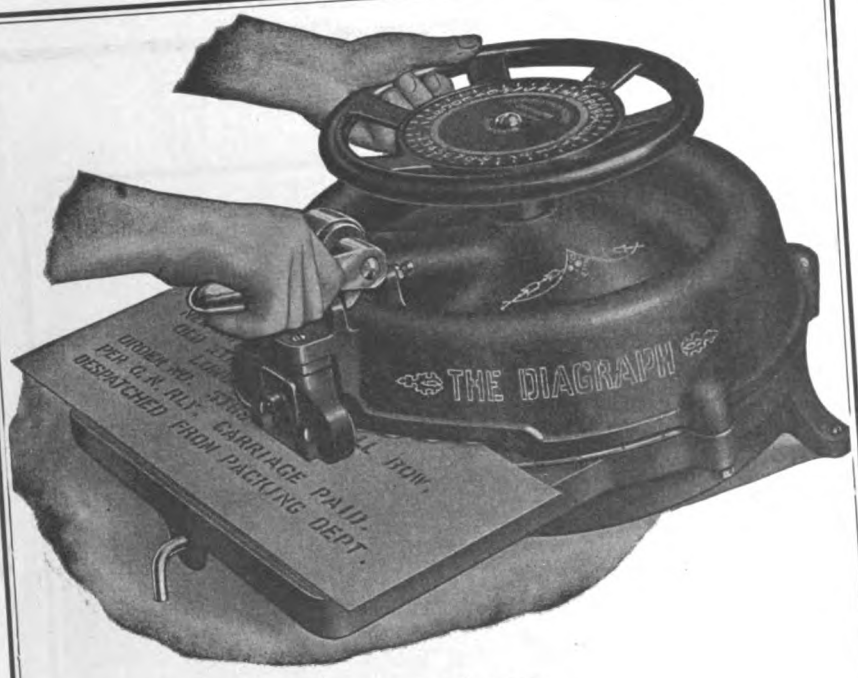
LANCASTER, PA.

501 Fifth Avenue
New York

Wesley Building
Philadelphia

TANKS
LANCASTER
STEEL PLATE CONSTRUCTION

Digitized by Google



READ "The Freight That Failed"

By Forrest Crissey

Every business man should read this illuminating article in the May 27th issue of The Saturday Evening Post. Mr. Crissey, in discussing the $100,000,000 annual freight claim losses, states that the use of stencils for addressing is a highly effective means of loss prevention. Read Mr. Crissey's article—then buy a Diagraph. Free trial in your own shipping room.

DIAGRAPH STENCIL MACHINE CORP.

1626 So. Kingshighway Blvd., St. Louis, Mo.

Branches in all principal cities—see phone book.

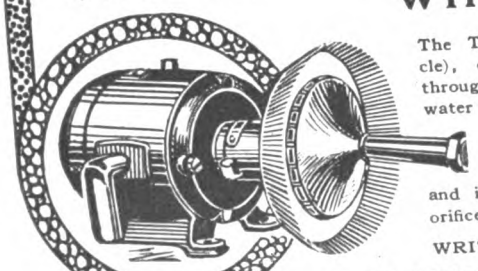
BREATHE LAUNDERED AIR

Clean wholesome air, containing the proper percentage of humidity, conditioned to a comfortable temperature, is absolutely essential for maintaining bodily vigor at its highest pitch.

The Bayley Turbo Air Washer

supplies pure air by passing atmospheric air through a fine water spray to remove impurities and through a conditioning chamber to regulate temperature and humidity. Uninterrupted service is assured by an atomizer that

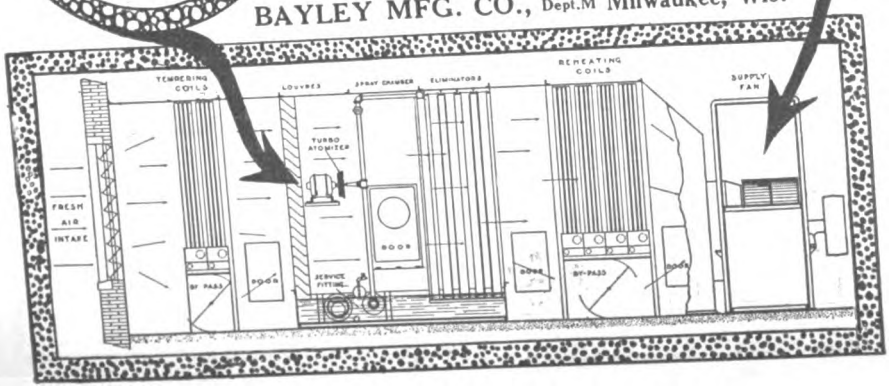
Will Not Clog



The Turbo-Atomizer (shown in the circle), distributes a fine spray evenly throughout the spray chamber, at low water pressure. Impurities washed out of the air will not clog it, as the smallest water passage is 5/8" in diameter. It fits any air washer and is an ideal unit for replacing fine orifice system

WRITE FOR FREE BULLETIN TODAY

BAYLEY MFG. CO., Dept. M Milwaukee, Wis.



(Continued from Page 32)

ducted by the employees but are backed by the company. They were organized in November 1919, when a number of talented players, who were formerly members of other bands, formed an industrial musical association. The jazz band is in big demand for dances and entertainments.

Piano music beguiles every noontime at the restaurant of this company, and also in the evenings at the service building for impromptu concerts and dancing.

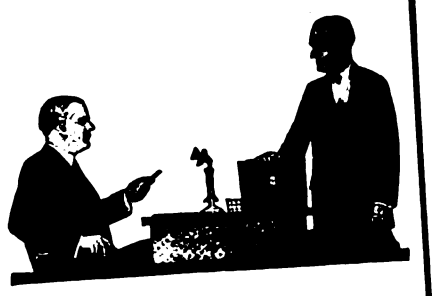
Employees of the Eastman Kodak Company hear music by a band, an orchestra and a glee club, the former consisting of both men and women and containing sixty members. The band gives concerts every noon during the summer and the orchestra plays for regular noontime dances, as well as several more formal affairs during the year. The glee club sings at intervals through the year inside the plant, as well as in public affairs outside the plant.

The latter organization dates back to 1911, when it was started as a male organization. It was thrown open to women in the following year.

Pianos and victrolas located in a number of departments of the John B. Stetson Company, of Philadelphia, are freely used. This plant goes outside for the biggest musical event under its supervision in the season, inviting the Philadelphia Orchestra to give one concert annually, which becomes the most popular affair of the year. The Stetson Chorus, containing one hundred voices, is twelve years old. There is also an orchestra and banjo-mandolin club in the plant.

Musical organizations have been in existence for four years at the plant of the National Cash Register Company at Dayton, O., and include two orchestras and a chorus.

The encouragement given these musical tendencies among industrial workers has been an accompaniment of general pleasant relations between employees and employers in plants that are noted for the smoothness with which their affairs progress from day to day.



"IT'S YOUR ORDER, Because Your Company Has a PHOTOSTAT."

"This is a job where delivery is paramount. And, in every case, I have made it a point to find out what kind of equipment the bidder had in order to make good his promise.

"Your Company has a piece of equipment on which I have learned to rely. I know what the PHOTOSTAT is and what it can do. I know you will not have to lose any time tracing. You can make PHOTOSTAT copies and get started on your shop work right away. In other words you'll be days ahead and I also know that there can't be any mistakes in PHOTOSTAT copies.

"Yes, sir, you tell your chief he can thank the PHOTOSTAT for this order. I know you'll make delivery with that machine to help you."

PHOTOSTAT prints cost cents. Compare this with what it costs for a draftsman to make a tracing, a stenographer to copy a page, or an artist to reproduce a layout.

The experiences of many users, written in letter form, are contained in our booklet, "A Good Word for the PHOTOSTAT." Write for your copy today.

PHOTOSTAT CORPORATION

295 STATE ST., ROCHESTER, N. Y.

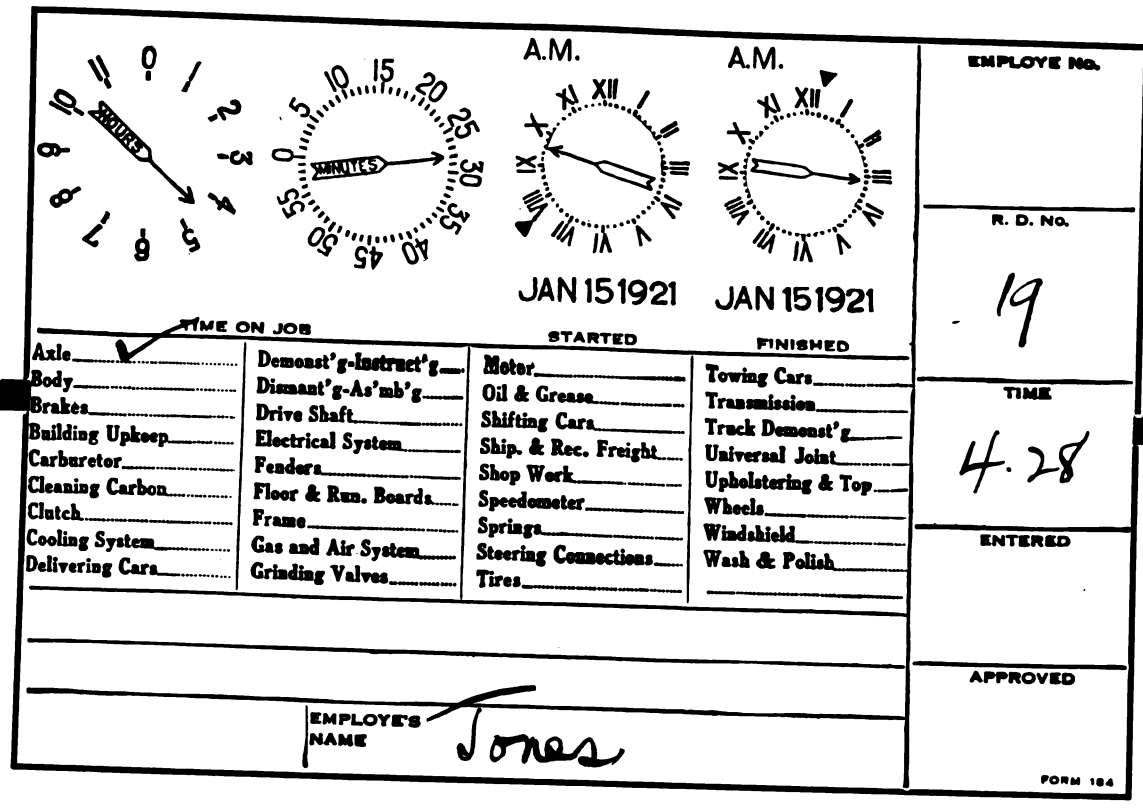
88 Broad St., Boston
123 W. Madison St., Chicago
209 Leader Bldg., Cleveland
7 Dey St., New York City
510 No. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington.

Executive Office: Providence, R. I.

PHOTOSTAT

Trade Mark

Digitized by Google



The Difference between Practically and Actually



Learn more about this durable Elapsed Time Recorder, by sending today for a complimentary copy of that valuable booklet:- "Elapsed Time Records."

"It took me practically four hours on that job," and that is the way Jones would have reported his time for putting the new axle into the doctor's car.

As a matter of fact, that record on the Calculagraph showed that it actually took him 4 hours and 28 minutes and when the doctor complained that it seemed a long time for such a job, the foreman brought out the time ticket which showed the following:

Jones began the job on the axle Jan. 15, 1921 at 7:48 a. m. He finished the job on Jan. 15, 1921, at 12:16 a. m. The Calculagraph automatically calculated and printed the elapsed time record on the face of the card showing that it took Jones 4 hours and 28 minutes. The doctor was charged accordingly.

Jones is a good, steady worker. The Calculagraph is a mechanical elapsed time recorder the record of which cannot be falsified. In these two the service station had an argument that convinced the doctor of the fairness of the charge. He was satisfied that this Service Station was making an effort to give their customers a "square deal."

But the Calculagraph is not designed for Service Station work only. It is in daily use in thousands of Garages, Repair Shops, Machine Shops, Factories, Billiard Parlors, Telephone Long Distance Lines, Industrial Plans, Power Houses, in fact, wherever an accurate Elapsed Time Record is of value.

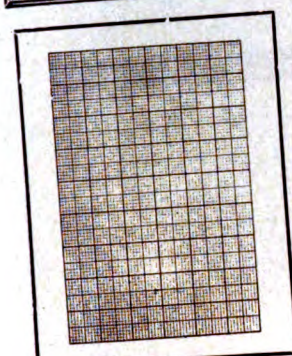
THE CALCULAGRAPH

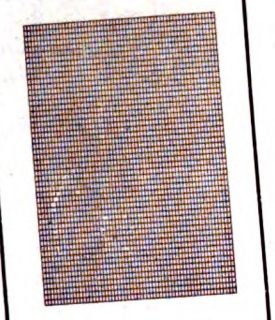
THE ELAPSED TIME RECORDER

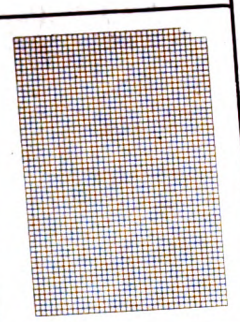
34 Church Street **New York City**

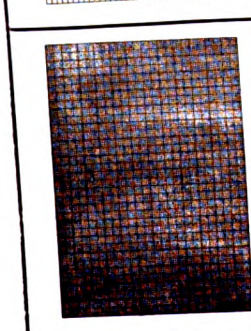
Digitized by Google

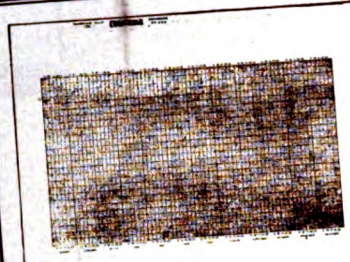
GRAPHICS HEA

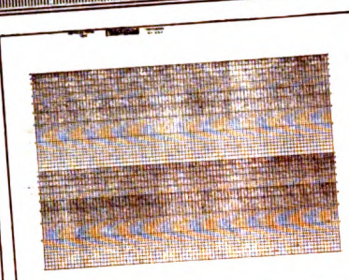


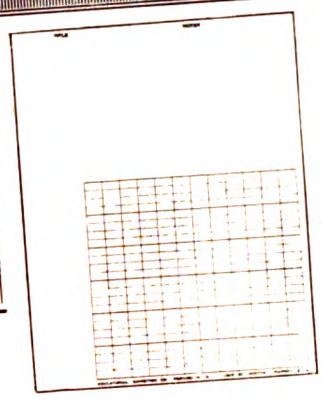












EDEXCO CHARTING PAPERS

These are the sort of charting papers you want because;

1. They are printed on letter size paper, so that they are easy to file in letter files or bind up with typewritten reports.

2. Wide margins are left around the engravings for insertion of scales, heading and notes. They are printed on white (on one side only) in a color of ink which reproduces readily.

3. They are printed on paper which is strong enough to stand hard usage but which is unwatermarked and transparent so blue prints can be made.

4. Most EDEXCO sheets are specially divided for plotting business data by days, weeks, months and years and contain the right number of spaces for this purpose. EDEXCO curve cards also embody all these features.

5. The arithilog papers, are very necessary for comparing rates of large and small items, such as waste with production and advertising with sales.

A few of our forms are illustrated in the border. For more information ask for Catalogue H or better still send for—

OUTFIT A

Combination Laboratory Outfits on Charting $3.

This outfit contains charting paper and instruction booklets for a study of how to graphically record facts on charting paper. All styles are shown and besides annotated samples there are blank working sheets ready to try on your own business figures.

WORKING SHEETS

16 kinds 8½ x 11 inch charting paper: 8 blank and 8 with brief description of the uses on each. Ten sheets 8½ x 11 inch Arithilog Paper: one No. 179, 3-No. 180, 2-No. 181 and one each, No. 181½, No. 182, No. 183 and No. 184.

BOOKLETS OF INSTRUCTION

Pamphlet No. 805, "Standards for Graphic Presentation." Pamphlet No. 806, "Graphic Charts for the Business Man", —Gilman.
Series of 4 reprint articles "The Ratio Chart and its Applications."—P. A. Bivins.

OTHER EDEXCO SUPPLIES

Graphic Headquarters also carries in stock for your convenience many other devices you can't get readily elsewhere. For instance;—

Gummed Paper in colors. In sheet form or cut as tapes or symbols.

Colored Crayons, Oil Colors and Waterproof Inks.

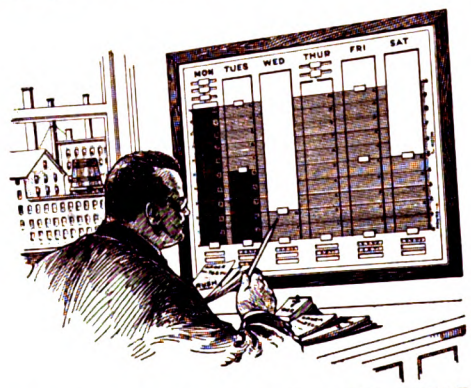
Swinging Leaf Fixtures with cork filled leaves.

Decimally-divided Stop Watches.

EDEXCO Cork Mount for maps, charts and bulletin boards. The best backing for pin charts in constant use.

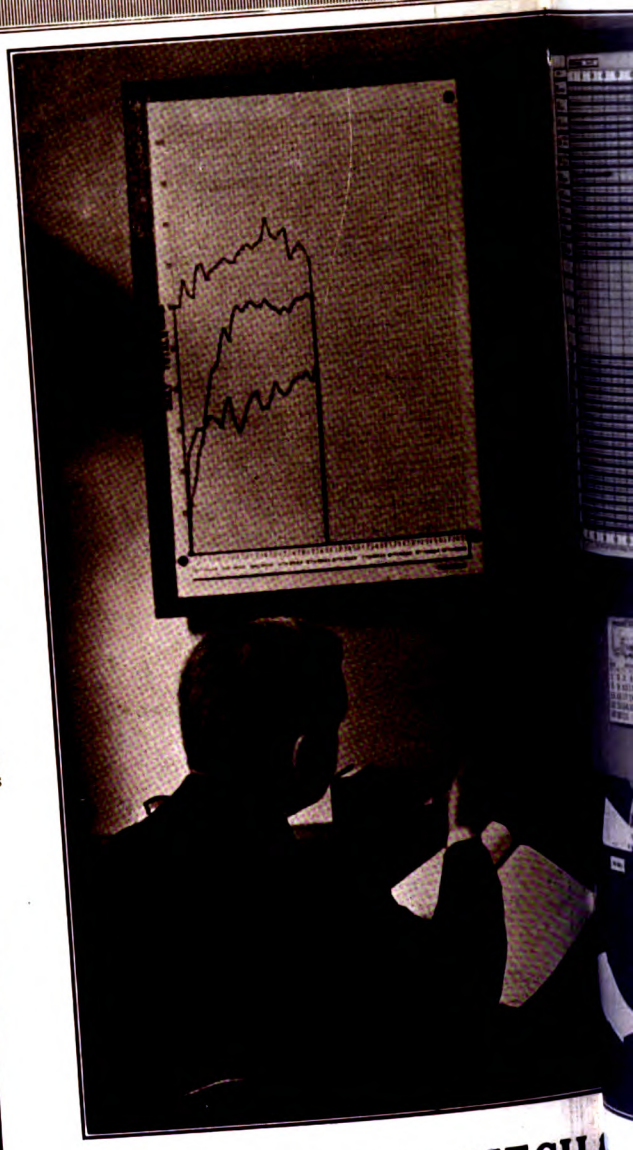
Books on Graphics.

Catalogue H will tell you more.



EDEXCO COMPOSITE BAR CHART

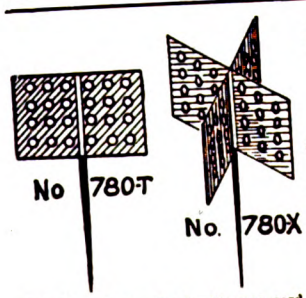
For showing condition or quantity of stock on hand or for assigning work to machines or departments.



EDEXCO MECHA

EDEXCO MECHANICAL BAR CHARTS, originate factory control boards, showing amounts in various pr also been extensively used with great success as quota pulation, flexibility of use and neat appearance make the

EDEXCO PINCORD CHARTS though newer are eq Graphs" goes into detail.



Pole Line Pins. Used with map cord to show power circuits on city plans or piping lines in a plant. Metal, two styles.



Series 300 Large spherical pin for display



Series 500 The Most Common Size used is this spherical head pin.



Series 600 For Congested Maps or charts and holding territory or route cord in place use this pin.



Series 5400 Glass Spot Pin. The spot is fused in the head of the pin. It cannot come off.



Series 5000 Enamel Spot or "Ring Pin." Spot is enameled on the glass. This and the glass spot pin photograph as a ring.



Series 5000 Special Markings Enamel Spots can be furnished as a DASH or CROSS if desired.



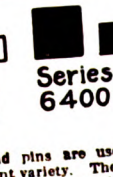
Series 7000 Oil Well Pin. Shape resembles oil well derrick. Can be supplied with two-colored head.



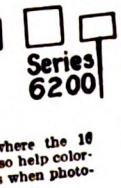
Series 6300 Triangular or Square Head pins are used where the 10 colors do not furnish sufficient variety. They also help color-blind users These pins show distinctive shapes when photographed whereas some colors photograph the same.



Series 6100



Series 6400



Series 6200



Series 3650



Rough Surface Gl Pencil will erase off from these pi again and again

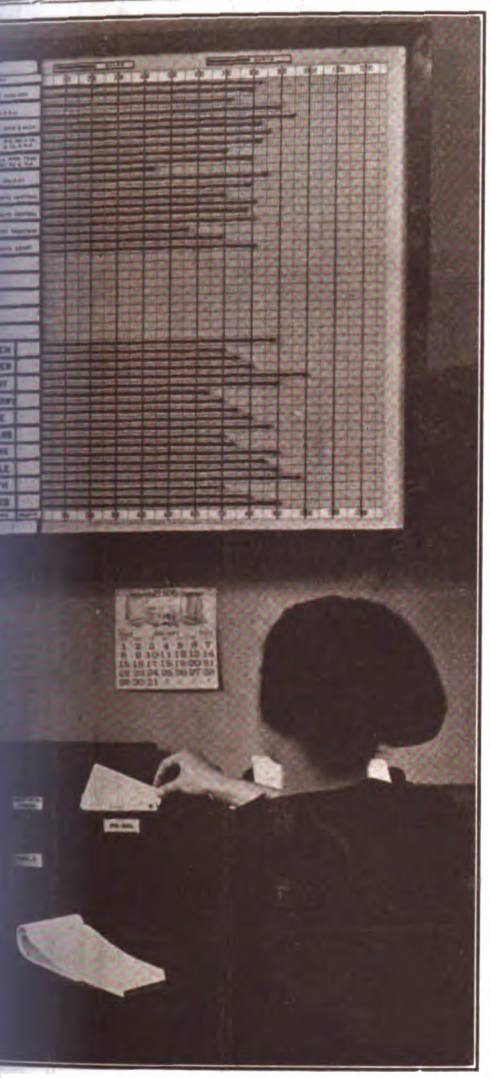
It Will Well Pay You To Be Informed On What Graphic

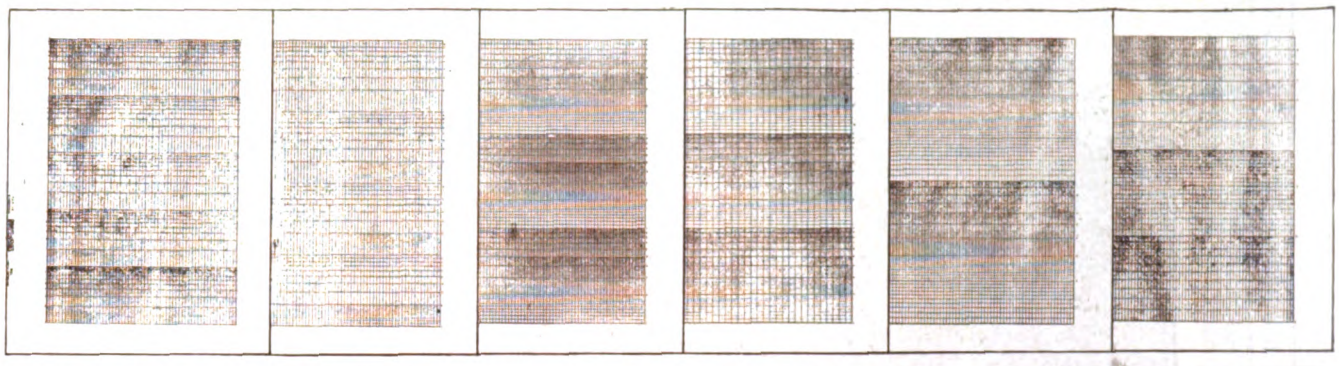
EDUCATIONAL EX

427 CUSTOM HOUSE STREET

Digitized by Google

ADQUARTERS





EDEXCO OUTLINE MAPS

The sort of maps you want and can't get elsewhere.

Plain U. S. Outline Maps showing every state with no lettering, in several sizes.

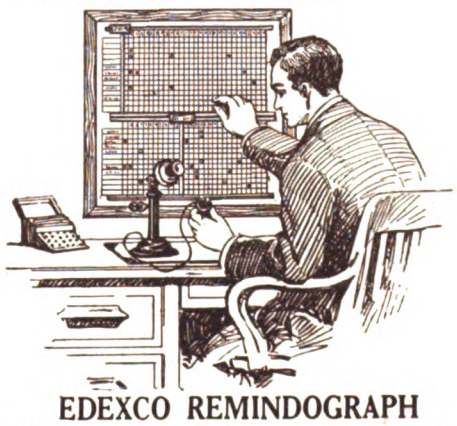
Individual State Maps showing county names and boundaries with plenty of room for coloring in or insertion of data in the handy 8½ x 11 inch size.

Large U. S. Maps showing all counties for sales territory work. Two sizes, one as large as 4 x 6 feet.

Maps of U. S. showing cities of given population; 25, 50 and 100 thousand respectively, corrected to latest census.

Also plain black and white maps showing railroads, cities and other details.

Catalogue H will give you details.



EDEXCO REMINDOGRAPH

An automatic mechanically operated follow-up device for routing orders through the factory or checking up on delivery of raw materials.

EDEXCO MAP PINS

These EDEXCO Markers for production charts and maps are available in 16 standard true colors and over 30 varieties among which the following are particularly useful.

1. Solid Color glass heads. The color is fused in and extends all the way through the homogeneous head.

2. Sharp steel needle points permit repeated use in production charts or sales maps. When EDEXCO Cork Mount is used 100 or more insertions in the same spot are possible.

3. Rough Surface Colored Pins you can write on with lnk or pencil. Erasures are easily made and pins can be used repeatedly.

4. Numbered Glass Head Pins with either black or white number against a brilliant color background.

5. Square and Triangular Pins which show up well in photostats or photographs where colors would otherwise disappear.

30 styles are shown in the lower border. For more information write for Catalogue H or better still send for—

OUTFIT B

MAP MARKING OUTFIT—$2.00

1 8½ x 11 inch Map of U. S. on EDEXCO Map Mount, with standard washable finish.

1 box of sample Map Markers, containing 100 map pins (some loose for experimentation).

1 box of 95 loose triangular, square and glass spot pins for special markers.

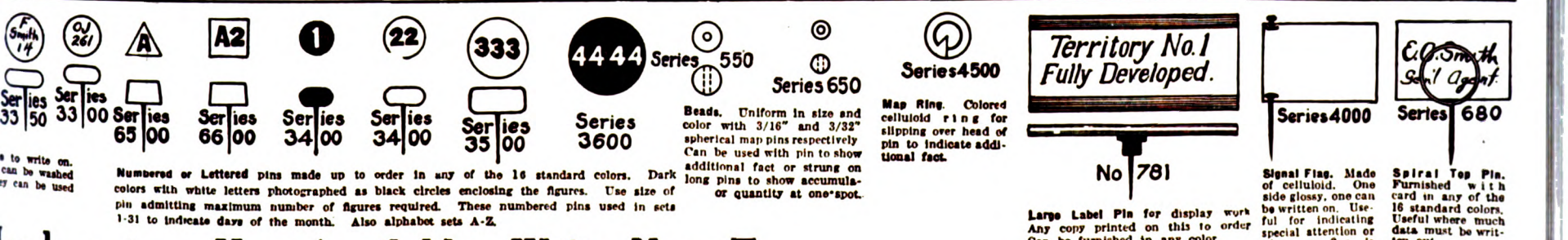
1 EDEXCO Primer of Graphics, telling how to mark maps.



ICAL GRAPHS

l perfected exclusively by us, are especially useful as s or for keeping perpetual inventory. They have s for salesmen. Their brilliant colors, easy mani- invaluable part of the conference or director's room."

valuable. Our illustrated pamphlet "Mechanical



to write on. can be washed y can be used

Numbered or Lettered pins made up to order in any of the 16 standard colors. Dark colors with white letters photographed as black circles enclosing the figures. Use size of pin admitting maximum number of figures required. These numbered pins used in sets 1-31 to indicate days of the month. Also alphabet sets A-Z.

Beads. Uniform in size and color with 3/16" and 3/32" spherical map pins respectively Can be used with pin to show additional fact or strung on long pins to show accumulation or quantity at one spot.

Map Ring. Colored celluloid ring for slipping over head of pin to indicate additional fact.

Large Label Pin for display work Any copy printed on this to order Can be furnished in any color

Signal Flag. Made of celluloid. One side glossy, one can be written on. Useful for indicating special attention or where a flag is preferred to a pin.

Spiral Top Pin. Furnished with card in any of the 16 standard colors. Useful where much data must be written out.

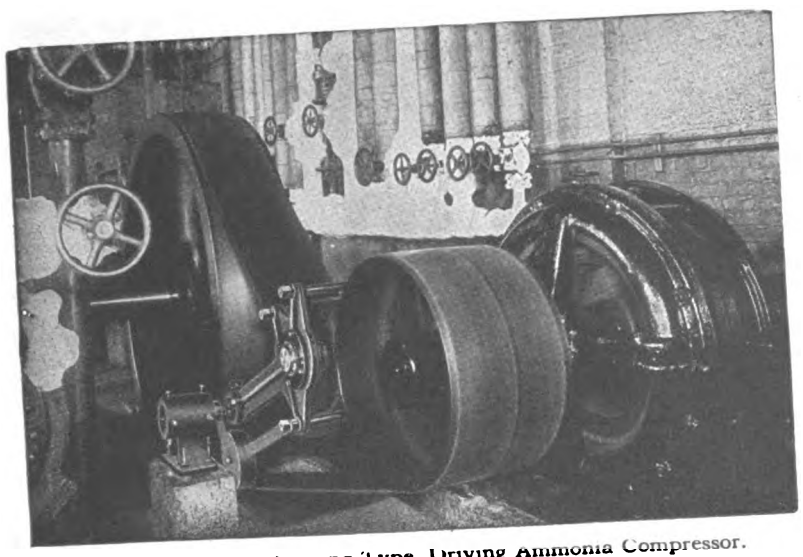
leadquarters Has Available, Write Now To

IBITION COMPANY

PROVIDENCE, RHODE ISLAND, U. S. A.

Digitized by Google

The Korap*Lenix Drive



200 H.P. Motor, 2-Bearing Type, Driving Ammonia Compressor.

Initial tension in bearings is absolutely necessary with ordinary open belt drives; it is practically non-existent with the KORAP-LENIX Drive.

With the KORAP-LENIX, two-bearing motors of much larger horsepower may be successfully operated where three-bearing motors with open belt drives would be essential.

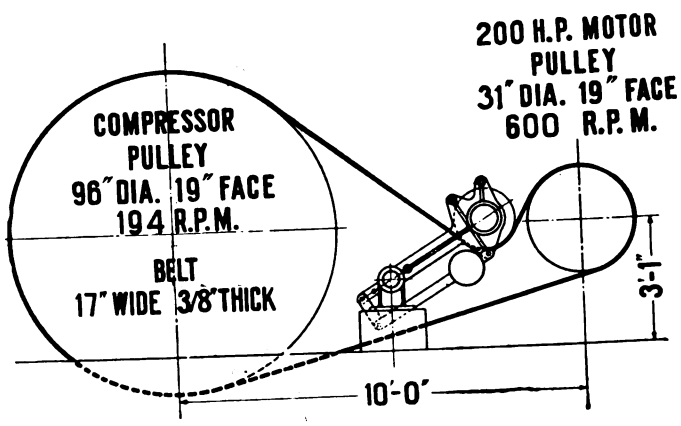
The saving in first cost of motors is obvious.

The practical absence of *initial* tension with the KORAP-LENIX Drive saves in bearing friction, lubrication and bearing renewals.

Belt slippage is eliminated—SAVING POWER.

The short pulley centers, not only possible but preferable with the KORAP-LENIX, save floor space.

Booklet
"SAVING SLIPPAGE AND SPACE"
contains interesting data on belt drives. Ask for a copy.



F. L. SMIDTH & CO.

Engineers

50 Church Street — **New York, N. Y.**

*Improved LENIX Drive.

Digitized by Google

The Modern Telegraph—Its Methods and Operations

(Continued from Page 23)

to the moment of delivery at its destination.

In his New York office, Mr. Gregson of Gregson and Todd, Attorneys, wishes to reach a client in Kansas City. This client possesses some facts that Mr. Gregson must know and it is imperative that he have them the same day. The hands of the clock in Mr. Gregson's office point to noon. Writing is out of the question; it is time to act and act quickly. He calls his private secretary and dictates a telegram. Before transcribing her stenographic notes of the message, she rings a call box. By the time the message is written, the messenger has arrived and the telegram is on its way.

An hour later Mr. Gregson returns from luncheon and finds on his desk an answer from his client in Kansas City.

And this is how it is done:

The moment the call box is rung the machinery of the telegraph company is set in motion. The box is circuited to the nearest telegraph office, several blocks away, and the call is registered on one of the eight or ten circuits which constitute the call box board. Each circuit has a bell of a different pitch, and on this bell a certain combination of numbers are struck. At the same time this particular number is registered on a strip of paper. In a card index underneath the board are kept the numbers, arranged in sequence, and the name and address of the firm corresponding to the number. But so expert has the call clerk become that he not only knows, by the pitch of the receiving bell, on what circuit the call occurred but also, by the number of strokes, the calling firm.

The messenger boy is dispatched and returns a few minutes later with the message, which he gives to the receiving clerk. The clerk time-stamps it, checks the number of words and the message is then placed in a tube carrier and shot through an underground pneumatic tube to the main office. The Telegraph Company operates the greatest tube system in the world, there being hundred of miles of such tubes in New York and the other large cities throughout the country.

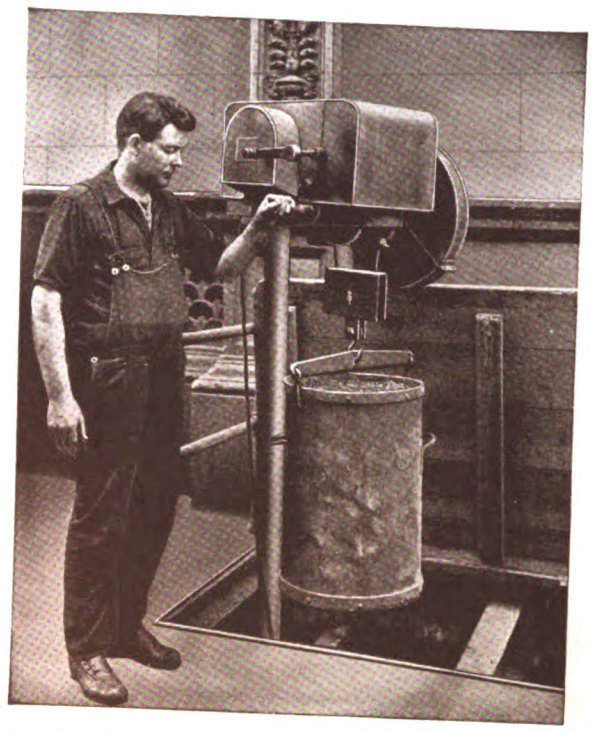
The message is removed from the tube in the New York main office and placed on a conveying belt that carries it to a distributing center. Here it is at once placed on another moving belt that quickly carries it into one of the operating rooms, where it is automatically deposited in a chute by the side of a supervisor, who places it in a container by one of the sending operators.

This operator, working at the sending end of a Multiplex, is seated at a perforating machine, an instrument with a regular typewriter keyboard, but whose keys produce certain combinations of holes on a strip of moving paper. As the message is typed on the tape, it passes instantly into an automatic transmitter. The number and position of the perforations produce a series of electrical impulses on the wire and operate directly the multiplex printer at the receiving end in Kansas City. The actual transmission is instantaneous, occupying but the minutest fraction of a second.

The receiving of the message at Kansas City is entirely mechanical. A detailed description of just how the electrical impulses operate the Multiplex Printer would require a lengthy explanation of a highly technical character, which is not possible here. It is sufficient to say that a certain combination of impulses operates a corresponding letter upon the Multiplex Printer, and the message is thus produced in typewritten form, the spacing and proper arrangement of date line, address, etc., also being done mechanically.

At the destination the same efficiency of handling is shown. The moment the message has been received, it is time-stamped, placed on a conveying belt that passes in front of the operator, and is carried to a distributing center. If necessary it is routed by tube to a branch office and delivered by messenger.

A message going to a large town or city is delivered within 20 minutes, and within an hour in remote places.



227 Cans of Ashes Handled Electrically in One Kilowatt Hour

THIS test proves conclusively the economy of operation of the G&G Model E Electric Hoist.

At the Hotel Navarre, 7th Ave. and 37th St., New York City, estimated cost of current is slightly under 5 cents per k.w.h., and the official figures of the test (made with 6 cans—height of lift 9 feet) are as follows:

Raising Cans

Can No.	Volts	Amps.	Watts	Secs.
1	107	7.0	749	6.5
2	107	7.4	791	6.5
3	107	7.0	749	6.25
4	108	7.0	756	7.0
5	108	7.0	756	6.5
6	107.5	6.8	731	6.5

Average Watts, 755. Average Seconds, 6.6

Lowering Cans

Can No.	Volts	Amps.	Watts	Secs.
1	109	15.0	1635	7.0
2	105	15.0	1575	7.0
3	105	15.0	1575	8.0
4	105	14.5	1522	6.5
5	105	14.5	1522	6.5
6	105	14.5	1522	6.75

Average Watts, 1558. Average Seconds, 6.96

Average cost of operation of this G&G Model E Hoist (current consumption only) is, therefore, 1 cent for raising and lowering every 45 cans.

If you will tell us the kind of loads you are handling, the distance of lift, and something about the working conditions, our Engineering Department will be glad to recommend the proper G & G Hoist to meet your requirements and will quote you the cost of same. It places you under no obligation to ask for this information.

GILLIS & GEOGHEGAN

556 West Broadway **New York City**

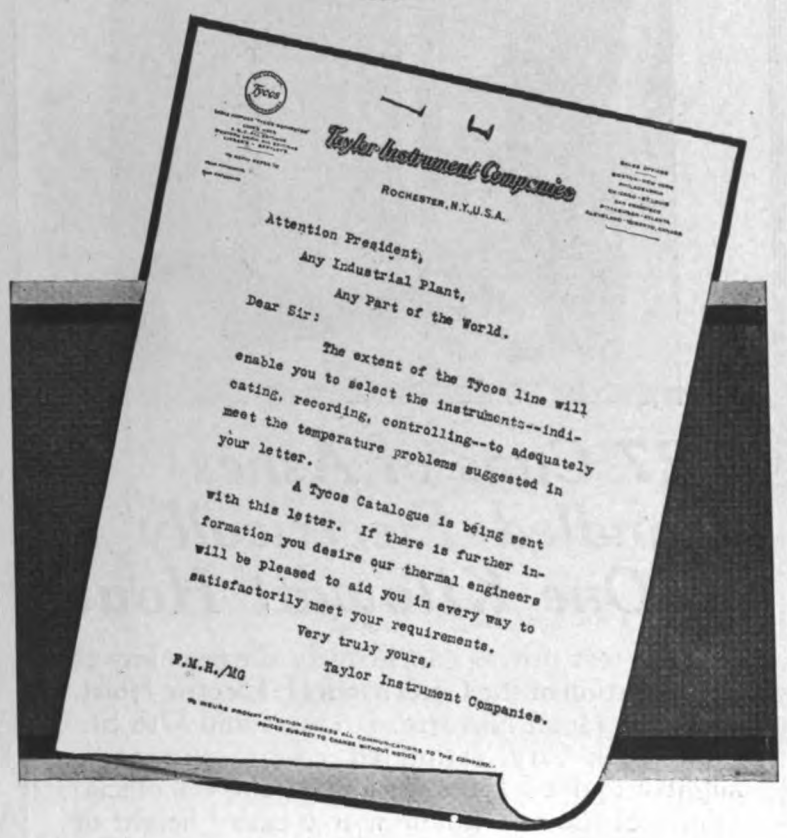
The G&G ELECTRIC REG. U.S. PAT. OFF

Telescopic Hoist

Digitized by Google

Temperature Instruments




Taylor Instrument Companies
ROCHESTER, N.Y., U.S.A.

Attention President,
Any Industrial Plant,
Any Part of the World.

Dear Sir:

The extent of the Tycos line will enable you to select the instruments--indicating, recording, controlling--to adequately meet the temperature problems suggested in your letter.

A Tycos Catalogue is being sent with this letter. If there is further information you desire our thermal engineers will be pleased to aid you in every way to satisfactorily meet your requirements.

Very truly yours,
Taylor Instrument Companies.

P.M.H./MG

In our entire line we list over 8,000 types and styles of thermometers and temperature indicating, controlling and recording instruments—from the delicate fever thermometer to take body temperature, to the pyrometer taking temperature by the thousands of degrees. The industrial applications are myriad. One of our catalogues lists instruments for steam and power plants, heating, ventilating, marine engineering.

—Another for industries depending on vacuum processes.

—Another for ice manufacture, refrigeration, cold storage and industries where the primary requirement is low temperature.

—Another catalogues instruments used in brewing, bottling, malting, distilling.

—Another covers canning, packing and allied industrial requirements.

—Another is devoted solely to gas works, by-product coke ovens and gas power plants.

—Another, industries in which the principal operation requires the use of long stem, high temperature thermometers.

—Anothe is for the baker, confectioner and allied industries.

—Another covers a complete line of regulators for controlling temperature in enclosed spaces.

—Others are devoted to milk industries.

—And still others to thermo-electric pyrometry.

Taylor Instrument Companies
Rochester, N.Y. U.S.A.

Theres a *Tycos* and *Taylor* temperature instrument for every purpose.

323

For the instant discovery of any breaks along its lines, the Western Union maintains an elaborate testing and regulating department. The test boards, located in the main office, are under the supervision of a wire chief and his assistants. By means of various testing instruments they quickly locate any break or fault and immediately substitute another wire over the most direct route available.

For example, a direct New York—San Francisco circuit may become crossed with another wire or develop other faults anywhere along the line. The trouble is usually discovered and another wire substituted within one or two minutes, after which the assistant wire chief finds where the trouble is by means of a so-called bridge testing set, which locates it so closely that the lineman may be told precisely where to go even to the number of the telegraph pole where the break occurred.

Several other features of the Telegraph Company's service are well worthy of comment. The telegraphic money transfer service for example offers the quickest means of sending money from one place to another. During the period of the war it was of immense benefit to relatives and friends of the soldiers in France. It is used in normal times for every purpose for which money can be sent and is constantly growing. During the year 1921 over $10,000,000 was transferred in this way.

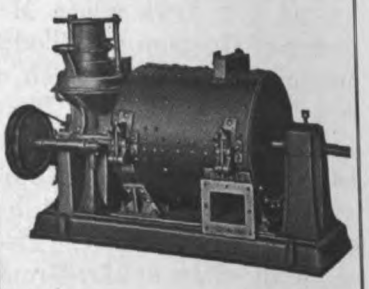
A second feature that has grown to important proportions is the maintenance throughout the country of self-winding clocks, regulated by signals from the Naval Observatory at Arlington, Va. At the present time over 100,000 of these clocks are in operation.

In closing that part of this article that deals with the land lines, a few words should be said about the part that the telegraph is playing in modern industry. The fact that the volume of traffic handled over the telegraph lines has more than doubled in the last decade, is due to several causes.

The business man of today is quick to realize the attention-compelling properties of the telegram, together with the fact that it invariably reaches

(Continued on Page 43)

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

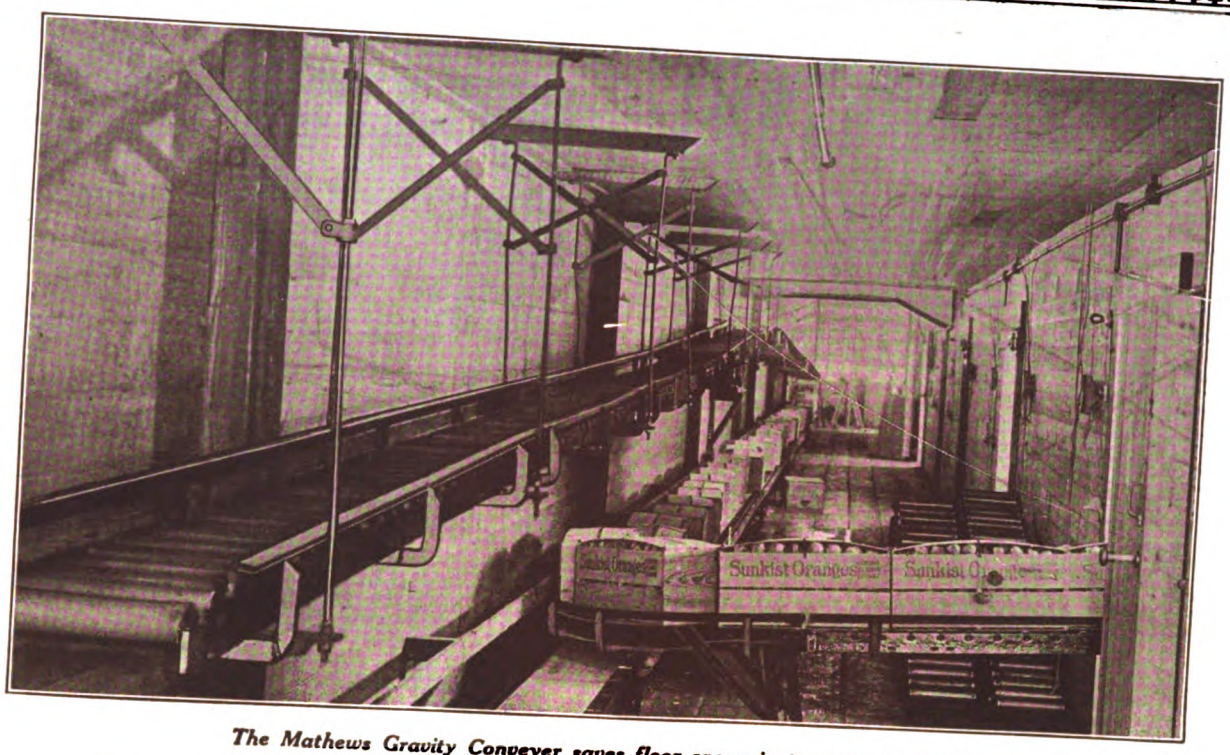
Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO
PULVERIZER
COMPANY

165 Broadway
New York

Digitized by Google



The Mathews Gravity Conveyer saves floor space in two-way conveying

Gravity displaces non-producers

Labor engaged in trucking, carrying, or any other form of conveying is non-productive. It yields no marketable returns for its wages.

A Mathews Gravity Conveyer will materially reduce non-production expense. It will displace practically your entire conveying force and keep materials always on the move. It will do your carrying more quickly and dependably than man-power and reduce breakage costs. Production will not be slowed up by the non-arrival of raw materials or congestion of the finished products when you depend on the

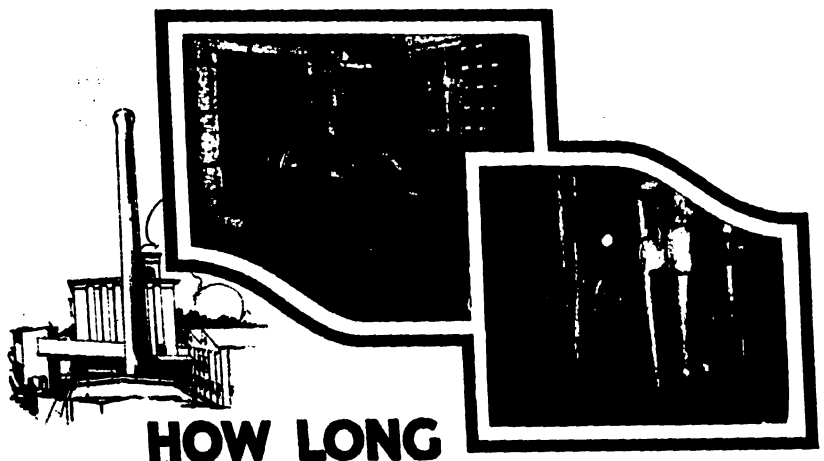
MATHEWS
SPEED ECONOMY
GRAVITY ROLLER CONVEYER

The Mathews system can be used for outside or inside conveying, from building to building, over roofs and through walls. The portable or permanent sections of steel ball bearing rollers can be supplemented by a number of special devices that make this system the most adaptable on the market.

Upkeep costs are negligible. The rollers are fitted with detachable ball bearings and full length axles. The sturdy construction will give enduring service under the most strenuous conditions of usage. Find what the Mathews Gravity Conveyer can save you. Drop us a line and we will send an engineer or illustrated literature, or both.

MATHEWS GRAVITY CARRIER COMPANY
157 Tenth Street, Ellwood City, Pa.
***Branch Factories*—Toronto, Canada—London, England**

Digitized by Google



HOW LONG SHOULD A TURBINE LAST?

WHILE the life of any piece of mechanical equipment depends to a large extent on the care and attention it receives, its potential life depends upon materials and design. The illustration at the top shows a Terry Lighting Set installed in 1911 at the plant of Joseph Benn Sons, Inc. There were no shutdowns or repairs until it was overhauled in 1921 when the glands, bearings and wheel were replaced.

The Terry Boiler Feed Unit illustrated at the right was installed in 1912, a new wheel was all that was necessary when it was overhauled in 1921. By replacing these worn parts they have practically restored the turbines to their original condition. Dividing the cost of these repairs by the number of years in operation shows an exceptionally low upkeep cost per year, thus it is possible to prolong the life of the Terry Turbine indefinitely by replacing the few wearing parts. This is an important item to bear in mind when considering the first cost of your Steam Turbine.

Bulletin Z-25 describes in detail the wearing parts and shows their accessible arrangement in the Turbine. Write for it and you can easily see you are making a permanent investment when you buy.

T-793

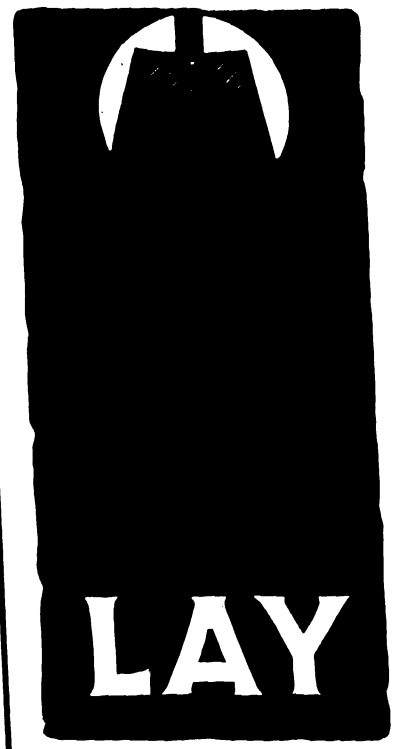
THE TERRY TURBINE



Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co.
Terry Sq. Hartford, Conn. U.S.A.

Save 50% in Your Sweeping Expense



Metal Case Brooms
Bench Brushes Casting Brushes
Street Brooms Hickory Fibre

by using LAY STAPLED METAL CASE BROOMS. Briefly, because they last longer, sweep cleaner and cost less per unit of service.

FORTY-FOUR YEARS

of broom making experience have been incorporated in our Patented Stapled Metal Case Brooms and is the reason why *they give such excellent service.*

You Run No Risk

Performance records prove their great economy. Every Broom is unconditionally guaranteed.

We recommend our No. 426 for general factory sweeping.

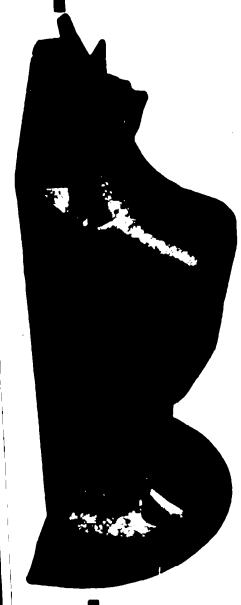
We furnish Brooms for 90% of the Steel Industries; 40% of the Railroads and more than 4000 industrials whose requirements run from 1 dozen to 2500 dozen annually.

Let us supply your Broom requirements

THE JOSEPH LAY COMPANY, Inc.
Grant and College Street
RIDGEVILLE INDIANA

ORIGINATORS OF THE METAL CASE BROOM

Specialists in STAMPINGS and SHEET METAL PARTS



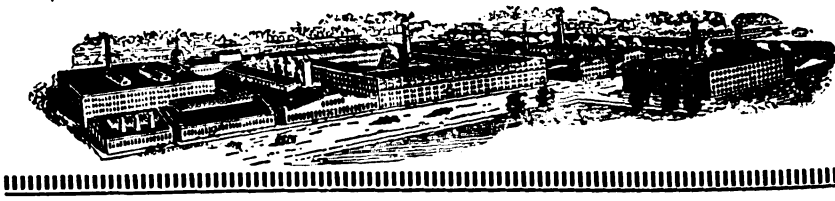
To produce STAMPINGS and SHEET METAL PARTS at the lowest possible cost requires expert workmen, skilled mechanics and ample facilities. In nine cases out of ten, the cost of Stampings made in your own plant is far too high.

Our entire plant, consisting of fifteen acres, is devoted to this one class of work—STAMPING, SPINNING, DRAWING, BLANKING, FORMING and PUNCHING in STEEL, ALUMINUM, COPPER, ZINC, BRASS or TIN.

G.P.&F. Service

Send us your blue prints or samples for estimates and COMPARE.

GEUDER PAESCHKE & FREY CO.
1300-1800 CANAL ST., MILWAUKEE, WIS.
DETROIT OFFICE: 712 DIME BANK BUILDING
CHICAGO: 352-358 WEST OHIO STREET



Digitized by Google

(Continued from page 40)

the person for whom it is intended, make it an ideal sales medium. He has learned from experience that an attractively worded telegram can sell anything from plows to life insurance.

Manufacturers use it for the advantageous buying of raw materials in a fluctuating market. For the quick disposal of surplus staples it is invaluable to the wholesaler and jobber. The largest business houses daily send out hundreds of messages, frequently night letters which permit of full expression at low cost, not only for the purpose of reaching their old customers, but also for the opening up of new territory, as well as for keeping in touch with their sales forces for the effective collection of delinquent accounts and for many different purposes.

The result is that the telegraph, which in former times was regarded as an emergency expedient only, has become a more and more extensively recognized vehicle of daily business correspondence, and to keep pace with the ever increasing volume of traffic the telegraph company is constantly striving to perfect its methods and sparing no effort to render as nearly as possible a perfect public service.

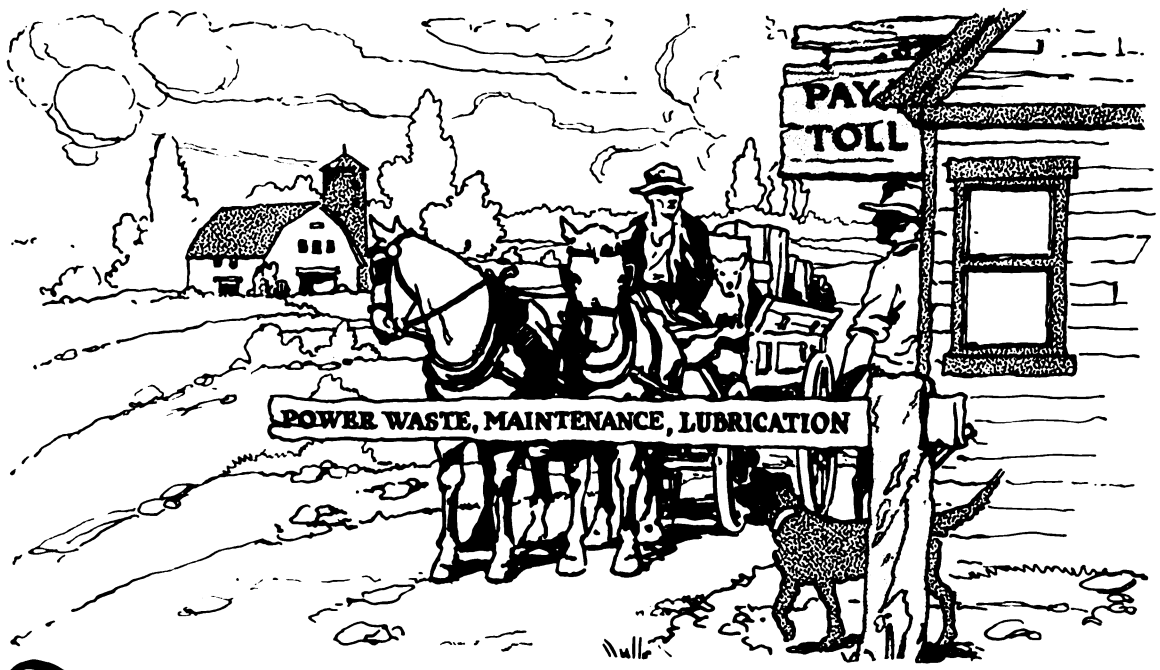
• • • •

THE history of the cable in its early days is filled with the tragedy of many failures. Many unsuccessful attempts were made to lay a trans-Atlantic cable before the first permanent one was laid in 1866. Since then many men have devoted their lives and their fortunes to make the cable what it is today, and it is to these early pioneers and the earnest men who carried forward their work that we owe the success that has finally been attained.

The earliest attempts to lay submarine cables were made either in shallow and shore waters, or across rivers. One of these cables, which was operated successfully for a short time, consisted of several cotton-covered wires enclosed in rubber and the whole then encased in lead pipe.

Innumerable experiments were made with various materials for the purpose of finding an insulator for the wire that would be not only a non-conductor but at the same time impervious to water and capable of withstanding great strain. The two insulating mediums used today are india rubber and gutta-percha, the latter being far the more preferable. A cross section of a modern submarine cable would show it to consist of a single conductor, composed of seven or more stranded copper wires, over which is an insulation of gutta-percha. This part of the cable, conductor plus insulator, is known as the core. For the sake of protection and to give it the necessary strength the core is wrapped in jute, encased in armor wire and then

Made Under SKF Supervision



The TOLL YOU PAY

POWER experts estimate that more than half of all power generated is consumed in overcoming friction. As the annual power bill in this country exceeds eight hundred million dollars, consider the staggering cost of this waste—the mountain of coal burned without productive energy. Consider also your own lessened cost of production if 60 per cent of this waste were saved and computed in the profit column.

Frictional resistance, due to the binding drag of plain lineshaft bearings, absorbs a large percentage of this waste power.

Skayef self-aligning ball bearing hangers permit the shaft to turn freely even under conditions of misalignment. In more than 7,500 plants they are reducing the friction toll by 60 per cent. In the cost of both maintenance and lubrication they are saving up to 80 per cent.

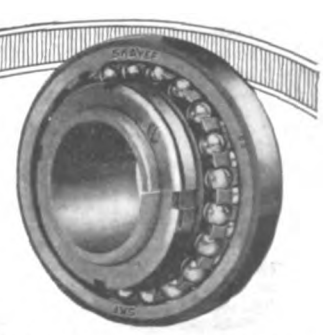
Skayef ball bearing hangers require so little attention that the maintenance man can be eliminated or put to more useful work. The cost of rebabbitting and replacing of the worn shafts is eliminated.

Oiling is necessary only three or four times a year. SKF marked self-aligning ball bearings are contained in housings sealed tight with felts, so that there can be no entrance of dust or grit, at the same time all leakage of oil is prevented.

They constitute an investment paying instant and continuous dividends in plant economy and efficiency, as well as profits. At our Showroom these facts will be more clearly outlined.



SKAYEF Self-Aligning Ball Bearing HANGERS (IMPROVED TYPE)



819

THE SKAYEF BALL BEARING COMPANY
165 Broadway New York City

Digitized by Google

For Your Own Protection Learn How to Tell Genuine

Linoleum

Look for the woven Burlap Back

Three Tests: ***1.*** All genuine linoleum is made of ground cork and oxidized linseed oil, pressed on a strong, flexible BURLAP back. BURLAP gives linoleum its strength and durability, adding many years to its service.

2. Genuine linoleum is flexible and not easy to tear, because of its sturdy BURLAP back.

3. When you buy printed linoleum, be sure to get the genuine article. Make sure that the edge is *brown.*

JUTE INDUSTRIES, LTD.

320 Broadway New York City

Ask your merchant to show you the woven BURLAP back



Photo Underwood & Underwood

A strong-jawed Boatswain of the U. S. N. tows three automobiles through Boston streets in this fashion.

IT'S NOT A JOB FOR ONE TOOTH!

Such a stunt takes good teeth—and lots of them. It's hardly safe to put all the strain on one tooth, —human molar or gear tooth.

That's exactly what the C. M. gyrating yoke guards against—an exclusive Chisholm-Moore Hoist development that keeps two-thirds of the lift-gear teeth always in mesh to carry the weight, instead of shifting the weight from one single tooth to another as in ordinary circular rotating hoist gears.

This patented gyrating yoke not only means a surer, more powerful drive, with remarkably low frictional losses, but insures smooth, easy action, higher speeds and *longer service.*

Catalog on request

The Chisholm-Moore Mfg. Co.
Cleveland. O.

CYCLONE HIGH SPEED HOISTS



wound again with several additional strands of jute. The whole is then thoroughly covered with tar.

The size of the cable itself varies greatly. Shore cables are usually from 3½ inches to 4½ inches in diameter. This is necessary on account of the friction caused by tides and currents moving it forward and backward along the shore bed. The outer diameter of the deep sea portion of a trans-Atlantic cable is only about one inch, as the water on the ocean bed at great depths is practically motionless.

When a cable is to be laid, it is coiled in large circular tanks, in the hold of the cable ship, and then covered with water. The cable ship has a clipper bow and on this bow are installed two or three sheaves, over which, during the process of laying, the cable passes at a rate controlled by a regulating machine. For repairing cables the ship is equipped with delicate apparatus by which the cable is located and with machinery capable of lifting the cable (the weight of which varies from 300 to 800 pounds per nautical mile) to the surface. Other apparatus that must be carried consists of grapnels of different types, buoys, various kinds of anchors, splicing machines, etc.

At the present time there are 17 trans-Atlantic cables operated by various companies. Seven of these are operated by the Western Union, who also operate three to Cuba and one to South America.

From the days of the mirror receiver, an instrument which threw a beam of light on sensitized paper, down to the syphon recorder of the present time, is a long step that has been accompanied by many and various difficulties. To actually understand the improvements that have been made and at the same time to understand the efficiency of handling which every cable message receives, it would be well to trace a typical message going from New York to London.

The message is received in the cable office in New York, either via pneumatic tube or Morse.

Over which cable it can be sent quickest is determined by the Traffic Distributor, who has a position not unlike that of a railroad traffic supervisor. He sees that the volume of business is equally distributed and by keeping in communication with London the fault of overloading any one cable is avoided. The message is placed in one of a number of files representing the different cables and stamped by an employee with the serial number and initial representing the particular cable over which it is to be transmitted, and the date of the month. After the brief record necessary for possible reference is made, the message is then routed to the Traffic Supervisor, who places it in a container by the side of the operator.

The operator is sending on an instrument that works on somewhat the same principle as in the sending Multiplex on the land line, namely by means of a perforator and automatic transmitter. The tape passing through the perforator to the automatic transmitter, sends negative and positive currents over the cable.

These negative and positive currents actuate the coil in the syphon recorder in London. Attached to this coil is a fine glass tube, one end of which is below the surface of the ink in an inkwell, the other or needle end vibrating against a running band of white paper. As the direction of the current is changed, so the glass tube moves upward and downward, forming characters that are read by the receiving operator at the rate of about fifty words per minute. The Duplex system is used on all trans-Atlantic cables, as the Quadruplex and Multiplex cannot be used on cables of great length. However, on some shore cables the Quadruplex is largely used.

The receiving operator reads the tape and transcribes the message on a regular typewriter. When the full message has been received it is placed on a rapidly moving belt that passes in front of the operator, and quickly conveyed to a Traffic Editor who checks it and then it is routed out for delivery. Numerous inventions of recent years have advanced the cable materially. Of these, the rotary repeater,

(Continued on Page 46)

Digitized by Google



Safety Prompted the Large Iron and Steel Mills to install "4100" GOLDEN-ANDERSON

Life and Property Insurance Valves

DOUBLE EXTRA HEAVY VALVES

"Every Valve sold With a Positive Guarantee."
"Hosts of References."

"The Heaviest Valve Made"

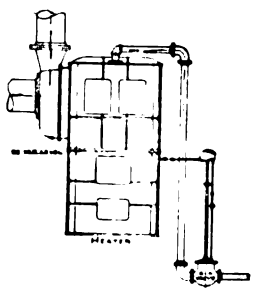
"You would do well to follow the example set by the expert engineers of these nationally known concerns. Your plant can be made equally safe."

C. E. GOLDEN.

1. Automatically cut out a boiler the instant that a tube ruptures or other internal break occurs.
2. Automatically cut off the steam flow from every boiler the instant that a steam pipe bursts.
3. Automatically equalize the pressure between all boilers.
4. Automatically cut in a boiler, making accidents due to inaccurate steam gage impossible.
5. Positively prevent backflow of steam into a cold boiler.
6. Can be closed by hand, like ordinary stop valve and arranged with "combination feature" to open valve like regular gate or globe valve.
7. Can be tested in service from the boiler room floor.
8. Double Corliss Dash Pot that cushions in opening and closing.
9. Cannot pound, spin, stick or chatter.



"No Shut-Down When a Tube Bursts"



Sizes to 30 in.
Feed-Water Heater



GOLDEN-ANDERSON

Pat. Automatic Cushioned Controlling Float Valves

1—They prevent feed water waste by carrying a constant water level in the heater by controlling the inflowing make-up water.

2—Double cushioned by air and water.

3—No metal-to-metal seating.

4—No sticking or corrosion.

GOLDEN-ANDERSON

Pat. Automatic Double Cushioned Check Valves

Automatically prevent disastrous reverse flow of pressure.

Especially adapted for use in discharge line of pumps.

No water hammer or shock on reverse flow of pressure cushioned in opening and closing.

Sizes to 30 in.

Angle and Globe Patterns



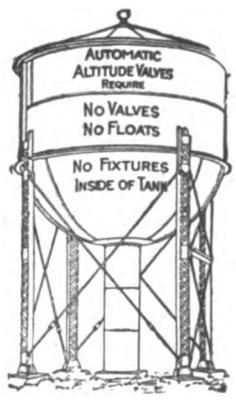
GOLDEN-ANDERSON

Patented Automatic Cushioned Controlling Altitude Valve

They should be in all supply lines to your reservoirs, standpipes and tanks to prevent water waste down the overflows.

For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. Three Ways of Closing "These Valves."





1st—Automatically by Water.

2nd—By Electricity, if desired.

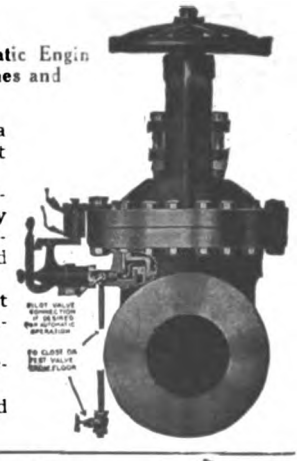
3rd—By Hand.

May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.

Golden-Anderson

Patent Cushioned Combined Throttle and Automatic Engine Stop Valves Provide Against Runaway Engines and Disastrous Accidents

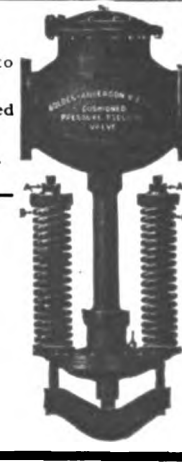
1. Pressing an electric button or opening a small hand valve from any distant point will instantly trip the valve.
2. Can be easily connected to close automatically the instant engine overspeeds by means of mechanical or electrical trip attachment. Disaster is therefore averted from this cause.
3. Cushioned by a Double Corliss Dash Pot that makes banging, chattering and sticking impossible.
4. Contains no tight-fitting parts. Supremely simple in design throughout.
5. Double extra strong in construction and virtually indestructible.



Golden-Anderson

Pat. Automatic Cushion Steam Pressure Return Valves

Safety Operating Piston makes it impossible for high pressure to enter into low pressure service. Makes accidents impossible.
Thoroughly cushioned—no hammering, chattering or striking.
No auxiliary valves or small by-pass—reliable and uninterrupted service.
Double extra heavy throughout—practically indestructible.
Only one adjustment—on the outside. Valves always accessible.



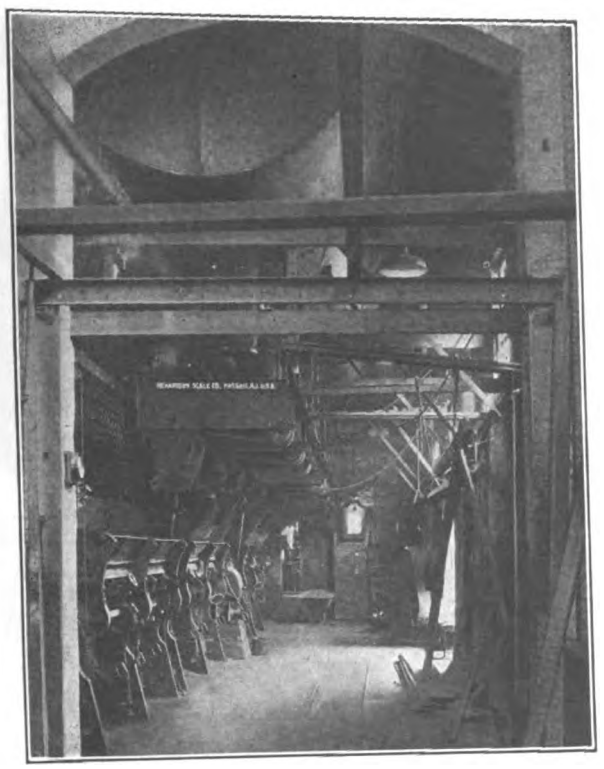
GOLDEN-ANDERSON VALVE SPECIALTY CO.

1306 Fulton Building, Pittsburgh, Pa.

Digitized by Google

Keep Your Eye On The Coal Pile

Power Costs Can Be Kept Down By Burning Coal Economically



A Richardson Automatic Coal Scale

Gives You the Control You Need Where You Need It Most

If a boiler isn't giving you the best efficiency, it will burn more than the usual amount of coal. The trouble may be due to soot, scale, holes in the fire or other cause that can be quickly detected, if you know exactly how much coal each boiler is using.

With 65% of your power costs figured in dollars and cents for coal, what would it mean to you to discover this waste, before it has a chance to dig into your profits?

The RICHARDSON is an entirely choke-proof machine. Weighs easily and accurately any kind of coal. Receives the coal automatically from overhead bunker, weighs it, and delivers it in a steady even stream to stockers.

Send today for Bulletin 4122-A

RICHARDSON SCALE COMPANY

Passaic, New Jersey

New York, Boston, Buffalo, Chicago, Minneapolis, Omaha, Wichita, San Francisco, Memphis, Atlanta

(*Continued from Page 44*)

originally developed on land lines, plays so important a part with the cable that it is worthy of special notice, for it made possible the direct working between New York and London without the use of any intermediate relay. Had it been developed several years sooner it would have been possible during the World War for President Wilson in the White House to have been in direct communication with General Pershing on the French Front.

What Ford is Doing and How He Does It

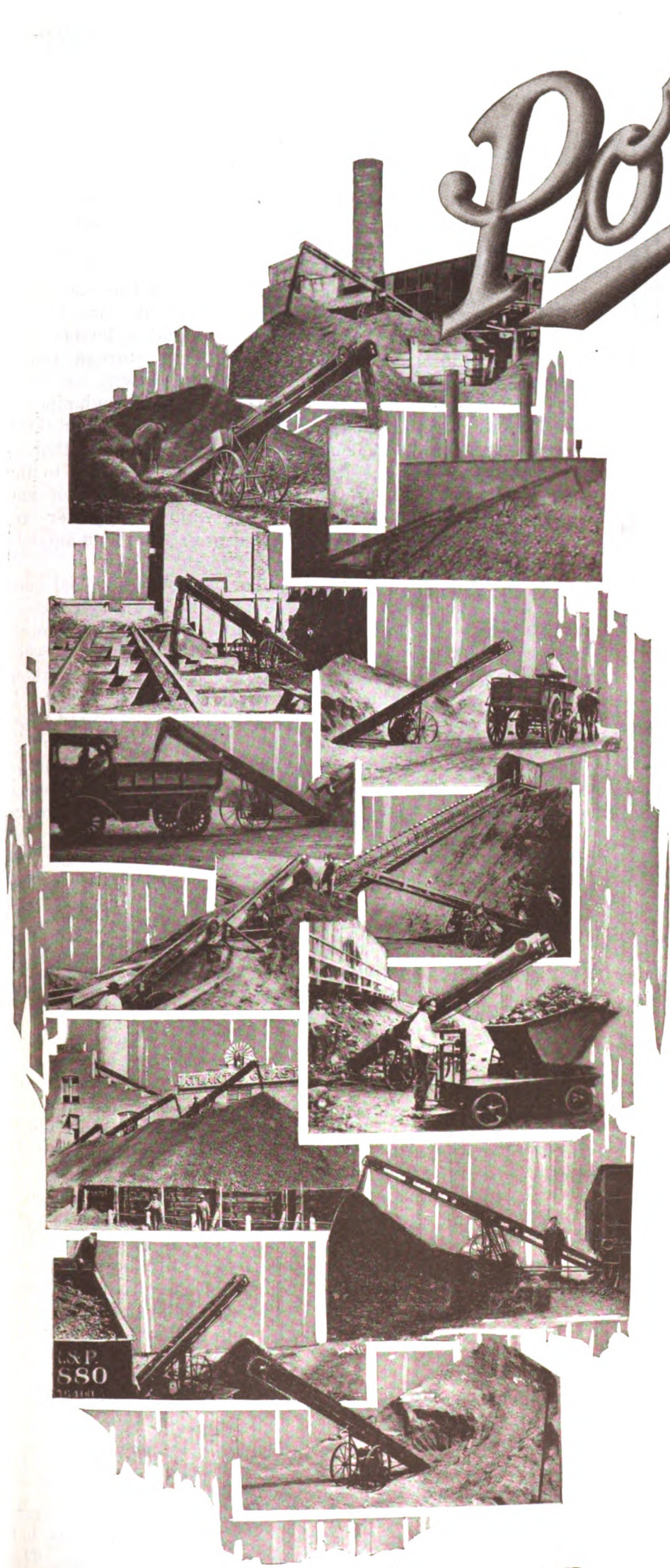
(*Continued from Page 13*)

tions also. This first section deals with departments of Industry not commonly parts of a metal-working plant. It takes one over the "High Line"—the concrete viaduct forty feet high and three-quarters of a mile long that forms the backbone of River Rouge, past the twelve million ton capacity concrete storage bins that skirt the River Rouge slip; it takes one through the coke ovens and through the by-product plant where fuel for melting ore and pig iron is produced and where coal gases are transformed into tar, fertilizer, illuminating gas and motor fuel. Other sections in later issues will take our readers on similarly personally-conducted inspection tours through the blast furnace plant and foundry—the latter the largest in the world—through the enormous power house whose equipment is the last word in economical power production, and again through the machine shops and assembling plant with their mechanically moving "lines" or pace-making conveyors.

Substantially all of the equipment at River Rouge that is shown on the pages of this issue is devoted to coal. Literally speaking, a river of coal flows continuously through this plant. How vital this supply is to plant operation has been recently impressed upon the public. Two thousand tons of coal per day are required at River Rouge for the coke ovens alone. Bear in mind when considering this figure that these coke ovens and the by-product plant that utilizes their gases are operated not as "commerical side lines" but as direct steps in the manufacture of Ford cars, trucks, and Fordson tractors. Thus, the coke produced in the coke ovens is used for melting ore and pig iron in the blast furnace plant and the foundry; the tar extracted from the gases of the coke ovens is used as a fuel in heat treating or other furnaces; the light oil extracted from these gases gives "motor benzol" used for motor fuel and also for making artificial leather for upholstery, and the illuminating gas which is the final by-product is largely used for core oven and industrial heating. The only "unusable" product is the ammonium sulphate or fertilizer, which is sold as is a small percentage of excess of illuminating gas and an equally small percentage of the smaller screenings of coke. Fundamentally, however, the coke ovens and the by-product plants are as directly used in Ford car and Fordson tractor production as are the Ford foundry and machine shops.

The key-note of coal utilization is uninterrupted transportation, as will be noted from the accompanying pictures, and surely transportation becomes a pressing problem when daily quantities such as two thousand tons of coal, fifteen hunderd tons of coke, ten thousand gallons of benzol and twenty-two million feet of illuminating gas are involved. A break in the transportation chain would undoubtedly mean stoppage all along the line, the only alternative being a tremendous piling up of materials. The engineering talent applied in laying out this transportation system has been of such high order and the equipment so well chosen for its purpose that the flow of materials continues hour after hour and day after day without interruption.

Digitized by Google



SCOOP CONVEYOR *Popularity*

FOR unloading cars, loading trucks, storing, reclaiming or transferring coal, coke, ash, sand, gravel, crushed stone, etc.

No condition or set of circumstances ever seems to swerve or change people's good opinion of the Scoop Conveyor.

Ever since we originated this particular type of portable conveyor it has met with the complete approval of conveyor-wise buyers.

The reasons, of course, are bound to be both simple and sound.

The Scoop Conveyor proves and re-proves every day, its extraordinary value—by its dependability in service, its adaptability to any task and its almost miraculous low cost per ton of material handled.

It follows, almost inevitably, that public feeling should now be merged into the definite conviction that the Scoop Conveyor is the best conveyor for its work in the world.

Write for Catalog No. 63

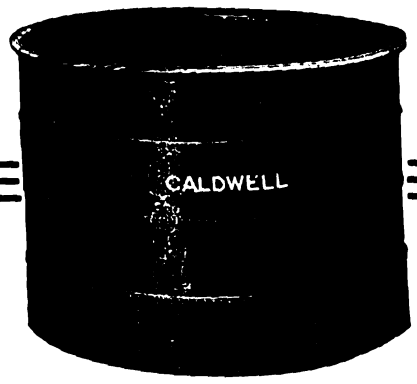
Portable Machinery Co.

Passaic, N. J.

PORTABLE MACHINERY CO. PASSAIC, N.J. U.S.A.

Ask Any User

Digitized by Google



Records Speak Volumes

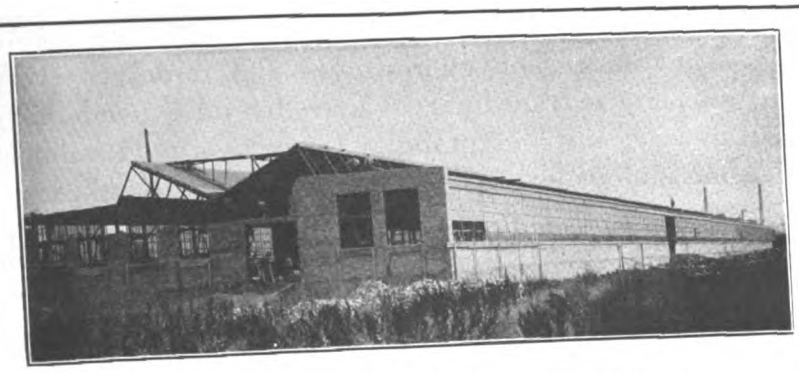
The unusual qualities of Caldwell Cypress Tanks are proven by their enviable records in all sections of the country. Perhaps this is largely due to the fact that, of all woods, cypress is the one which lasts best outside its native climate.

Thirty years' experience in building tanks enables us to couple this remarkable tank wood with workmanship and design that insure the maximum of tank satisfaction.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook St. Louisville, Ky.

Caldwell TANKS AND TOWERS



Construction Costs Have Reached the Bottom!

THE cost of building factory structures is at the lowest point since 1913. The increase in demand for additional manufacturing space which is already following the resumption of activities in many lines will soon produce an increase in building costs. Those who need factory space but have waited for the lowest point in building costs can profit by building during 1922.

An additional saving can be made by employing "MRBN" Engineers to plan the building for you. Write for one of the members of our firm to come and outline to you our method of handling the design of industrial buildings at minimum cost to you.

Thirty Years of MRBN Industrial Buildings

Build Now!

MILLS · RHINES · BELLMAN & NORDHOFF
Engineers
TOLEDO · OHIO

Oil, As A Fuel for Steam Power Generation

(*Continued from Page 18*)

things that have become accepted as right, in the field of power generation.

When we first started to burn bituminous coal for steam power generation, about all we knew about coal was that it would burn, and that it gave off a steady, intense heat, and that there was practically an inexhaustible supply of it. Some inquisitive men of science came along and discovered that bituminous coal could be made to yield gas, tar, ammonia—a long series of products of inestimable value—and still leave a fuel, coke, which was better fitted for burning than the original coal. Then, with the tremendous growth of the steel industry—which is absolutely dependent upon coke—it became more than ever plain to thinking men that the burning of bituminous coal was an economic crime. But by that time, we had been using the raw coal as fuel long enough to become thoroughly steeped in tradition—that bugbear of progress. And we will probably go on burning raw coal until we, collectively, get sense enough to coke it and extract the by-products; a thing which will probably be hastened by the ever-increasing demands of the steel industry for coke. Incidentally, when coal is treated for by-product recovery, one of the by-products is motor benzol, which must before long be counted on to eke out our dwinding supply of gasolene. Logically, then, every bit of our bituminous coal should be treated for the recovery of by-products; the steel industry should have first call on the coke thus produced; and industrial power should come from the balance of the coke, plus the use of fuel oil wherever economically possible, plus an intelligent and large-scale development of our water-power resources.

Meanwhile, having gone into the question of what coal can do—what does oil, fuel oil, hold in the way of immediate promise under existing conditions?

From the time it comes out of the ground until it gives up its heat under the boiler, oil approaches far more nearly the engineer's idea than does coal. Instead of being loaded, handled, unloaded and re-handled half a dozen times between producer and consumer, oil is pumped through pipe lines from the wells to the refineries where it is distilled. From these refineries the fuel oil is shipped in tank cars to the consumer—and a flexible pipe carries it to storage tanks, while either gravity or small pumps carry it through pipes to the burners. The whole thing involves a simplicity that is marvellous in contrast to the huge agglomeration of machinery and man-power required to get coal from mine to boiler room.

The heat value of coal runs from nine thousand to fourteen thousand B. T. U. per pound, while fuel oil runs between eighteen and nineteen thousand B. T. U. per pound. It should be remembered, too, that efficient combustion is more easily attainable with oil than with coal. Boiler efficiencies, with oil burners, range from seventy to eighty per cent., which is equal to the best efficiency attained in a well managed coal-fired boiler; and with oil, there is less chance for inefficiencies to creep in through laziness or carelessness on the part of the operating force.

The chart shown on the opening page of this article offers a ready means of finding out what fuel oil can be expected to do in any given power plant. If you know (as you should) what the B. T. U.—content of your coal is, and what efficiency you are getting, it is a simple matter to find by means of the chart not only how much oil would be required to accomplish the same result, but also the dollars and cents comparison between the two. In other words, knowing the price of your coal and the price of fuel oil delivered at your plant, you then have an accurate idea of the difference in the cost of the two fuels.

Having gone so far, the rest is not a matter of charts, but of individual conditions. The saving in boiler-room labor charges with oil-fired boilers, ranges from practically nothing in small power plants, to as

(*Continued on Page 51*)

Digitized by Google

SKILLED FOREMANSHIP
—*the prime essential*

Scarcity of labor is already in sight. Efficient workers, as a rule, are now employed.

Labor scarcity means bringing in untrained people; it means conditions unfavorable to low costs and satisfactory output; it means a tendency toward unrest and complaints.

Keen management looks ahead and takes measures *now* to forestall these difficulties before they reach a crisis.

In meeting all such problems the prime essential is skilled and energized foremanship.

Give your foremen a fair chance to help you. Let them have the benefits of a training that will interest and stimulate them.

During the past four years the Business Training Corporation has conducted not less than 80 per cent of all the training for foremen carried on in the United States. This record is in itself a sufficient guarantee that our training course in Modern Production Methods is sound and practical. It appeals strongly to the foremen themselves. The meetings are conducted by members of an experienced lecture staff. The expense is moderate.

To any plant manager or other executive officer we will gladly send on request a descriptive booklet called "Making Better Foremen" which will bring you worth while suggestions for strengthening the stability and profits of your business. Write for your copy today—sent without charge or obligation.

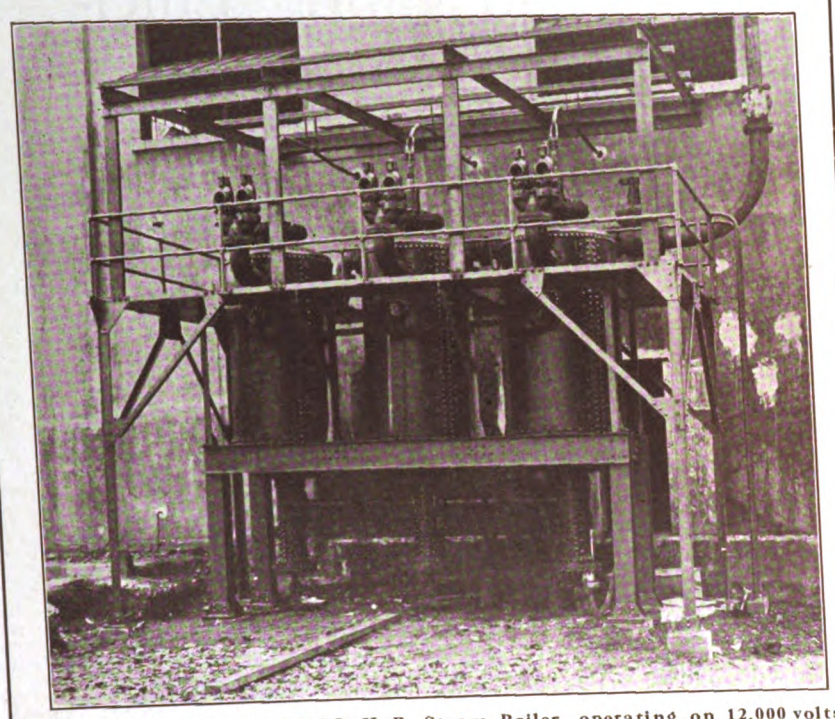
BUSINESS TRAINING CORPORATION

"Greater Team Work Through Group Training"

185 Madison Ave. New York City

Digitized by Google

"ELECTRO" STEAM BOILER



18,000 KW "ELECTRO" 1,800 B. H. P. Steam Boiler, operating on 12,000 volts, 3 phase, 25 cycle, evaporating 54,000 lbs. of water per hour at 125 lbs. pressure. Owned by Niagara Falls Power Co., supplying steam to the Cliff Paper Co., Niagara Falls, N. Y.
Floor space and height required: 21′ x 10′ 3″ x 22′.

Let your off-peak load generate STEAM

The "ELECTRO" Steam Boiler turns surplus electrical current into steam. It gives 98% Thermal Efficiency and Unity Power Factor.

Since the introduction of the "ELECTRO' 170,000 KW of this type of Steam Boiler has been installed. It was developed by Mr. F. T. Kaelin, Chief Engineer of the Shawinigan Water and Power Company and practical engineers everywhere recognize in the "ELECTRO" the solution of the perplexing problem of utilizing surplus electrical energy.

The "ELECTRO" Steam Boiler is operated by means of high tension A. C. current—any boiler water can be used—no softening or treating necessary. The initial cost is low—requires minimum space and maintenance—generates highest steam temperature—fully approved and sanctioned by boiler insurance underwriters.

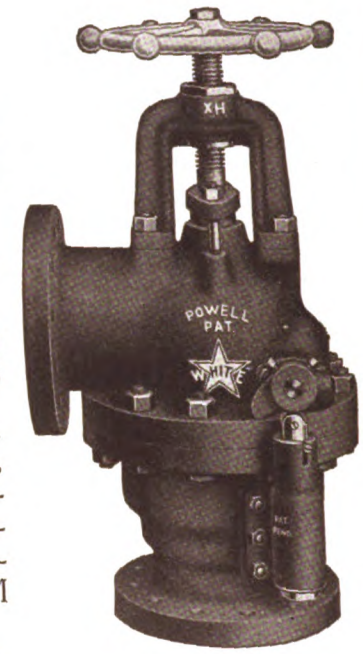
Send to-day for full particulars of the "ELECTRO" Steam Boiler and why it turns wastes into Profits.

ELECTRIC FURNACE CONSTRUCTION COMPANY
908 Chestnut St. Philadelphia, Pa.

WHITE STAR POWELL VALVES

Give Added Boiler Insurance

Powell Triple Acting Valves automatically close when a tube bursts—isolating the boiler from the rest.



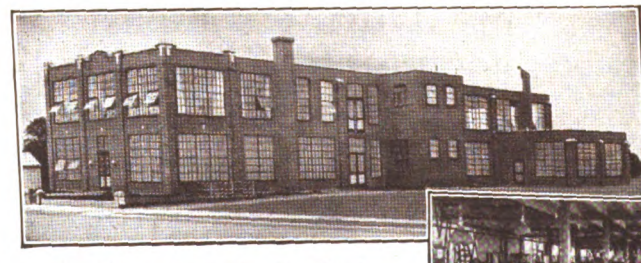
"WHITE STAR"
TRIPLE ACTING NON-RETURN BOILER CHECK VALVES

protect life and property. They last almost indefinitely, due to the regrindable, renewable seat, and slip-on, renewable disc, cast of Non-Corrossive, "POWELLIUM NICKEL."

Ask your dealer for POWELL VALVES or write us direct.

The Wm. Powell Co.
2525 SPRING GROVE AVENUE CINCINNATI, OHIO

SPEAKING OF YOUR NEW BUILDING!



The Royersford Needle Works
erected in 47 days including entire mechanical equipment and installation of machinery.



—INTERIOR—

CERTAINLY you are interested in saving. Have you looked into our Standardized Industrial Building Service? Not only the saving of cost on plans and specifications—but think of the time for production you can save when we complete the larger structures within 90 days and in some cases as quickly as 30 days.

Minimum Cost Maximum Service

Write for booklet

THE BELING-BUSH CO., INC.
FACTORY ENGINEERS AND BUILDERS
Drexel Building Philadelphia, Pa.

THE SERVICE

Digitized by Google

(Continued from Page 48)

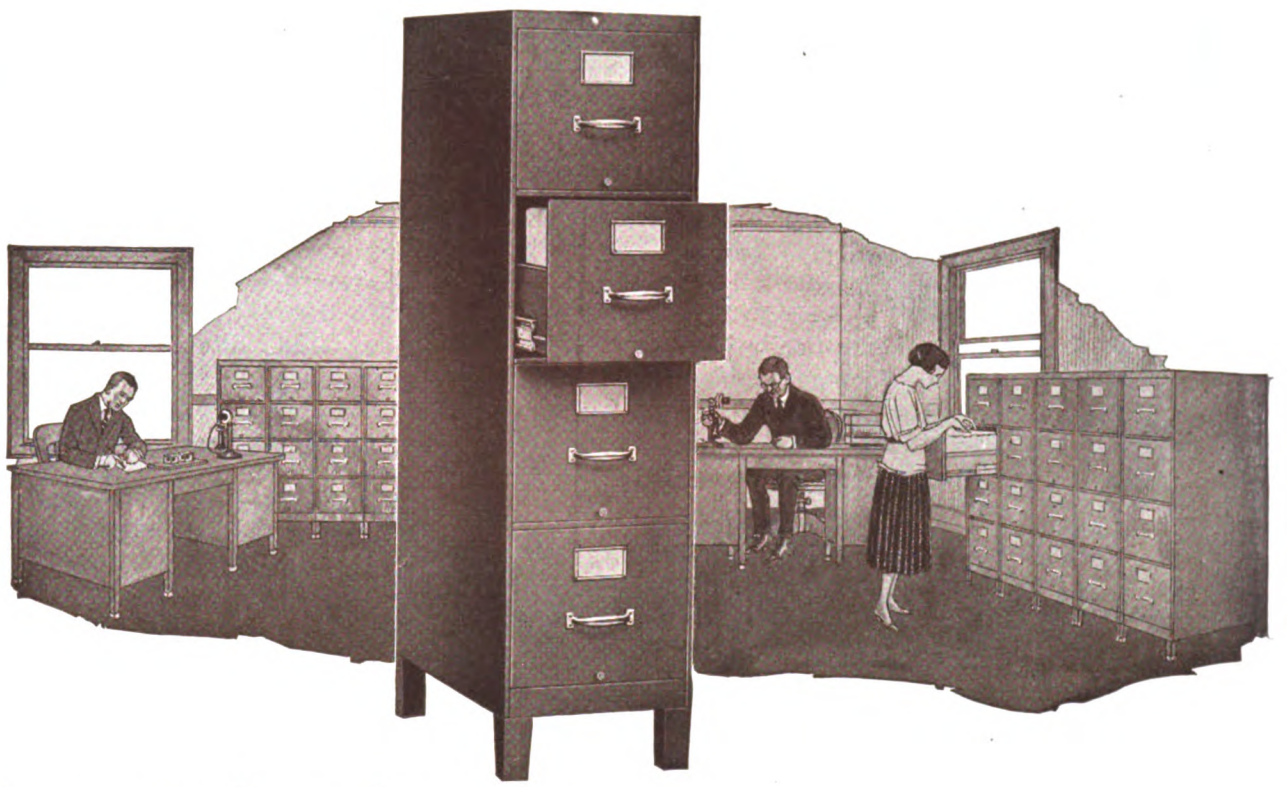
much as sixty percent in central stations and large plants. The saving in cost of getting the fuel from railroad siding to boilers, on the other hand, is often greater in small plants than in large ones; because the smaller plants employ labor for this purpose, while the large ones use mechanical conveyors.

Having taken these factors into consideration, we must pry more deeply into the particular requirements of your plant. Have you a fairly constant demand for steam, or are there sudden, heavy peak loads?—because oil burners can respond almost instantly to heavy demands, without continuing to burn up fuel after the demand drops. Is it necessary to bank your fires?—because a banked fire burns up fuel, while oil burners can be shut off; and it takes no longer to start cold, with oil, than to start from a banked fire, with coal. Also, in most cases, it is possible to increase the boiler capacity merely by installing oil burners in place of coal grates; so that there are occasions when the installation of oil burners will save the cost of additional boilers for a needed increase in power.

There are both skeptics and enthusiasts on oilburning, as well as on every other subject under the sun. The skeptic harps on the growing scarcity of oil (which, as a matter of fact applies only to those oils from which gasolene is derived, and not to the crudes which yield fuel oil) and asserts that oil-burning is only an experimental fad. The enthusiast makes wildly extravagant claims and says that coal cannot begin to compete with oil. The truth lies about midway between these extremes: oil-burning *has* passed the experimental stage, but there are cases where it cannot economically displace coal—as witness, on the one hand hundreds of plants successfully burning oil, and on the other hand hundreds of plants which after full investigation continue to burn coal. And whether it would pay you, in your plant, to burn oil—is a matter dependent not at all on what anybody else says has happened in some other plant, but is dependent upon individual facts easily ascertained.

Ultimately of course we have got to look at the whole power question in a much broader light. When the rank and file of us once see that cheap power is the only key to progress, that it holds the solution to all of our vexatious social and political problems—then, and only then, will we look upon coal and oil and running water with a proper perspective. Until that time, we can only muddle along and meet the needs of the present. We cannot afford to scrap all the money investment in boilers, stacks, engines and so on. We cannot overnight change our whole industrial scheme as it must some day be changed, but must gradually work toward the ultimate goal.

An encouraging sign, is the fact that there is more real interest today than ever before in our natural resources. We have begun to look at coal, not as so much black stuff to be burned for heat and power, but as nature's great gift to man—



Announcing the new "Y and E" Commercial Steel File

—point by point—the best file "buy" ever offered

GENUINE "Y and E" quality and workmanship, electrically welded steel construction, real roller slides, standard "Y and E" drawer suspension—and all at *a price below anything* of its quality on the market. Without exception, the best file "buy" you've ever seen.

Note these outstanding advantages

1. Real roller slides and the same drawer suspension usually found only in high-priced files.

2. Ten inches more filing space than the average, making it the lowest cost per inch of usable space of any high-grade file.

3. Strongly re-enforced to make the file rigid and durable under the heaviest loads.

4. Beautiful olive-green finish with enamel baked right into the steel itself.

5. Standard "Y and E" construction, intermembering with the "Y and E" 5300 line of files.

See this file on display in all "Y and E" branch and agency stores. Or mail the coupon today for prices and details.

YAWMAN AND ERBE MFG. CO.

Filing System Service, Equipment and Supplies

1043 St. Paul Street ROCHESTER, N.Y.

Branches, Agents or Dealers in all principal cities

In Canada: The Office Specialty Mfg. Co., Ltd., Newmarket, Ont.

"Y and E"

Yawman & Erbe Mfg. Co.
Rochester, N.Y.

Please send information and prices on your new "Y and E" Commercial Steel File.

Name.....

Address.....

Digitized by Google

"VERTICO-SLANT"
DRINKING FOUNTAINS



Save 50% of your Drinking Water



R & S Drinking Fountains, with the Vertico-Slant that protects the workers' health, are economical in cost, maintenance and water supply. No waste—uses 50% less water than the ordinary bubbler.
Give your workers good, clear water, free from contamination by placing these R & S Drinking Fountains or Metal Body Coolers throughout the plant.
They aid Production.
Write today for catalog and full information.

"Lips cannot touch the nozzle"

RUNDLE-SPENCE MFG. CO.
MILWAUKEE, WIS.

MORRiS PUMPS

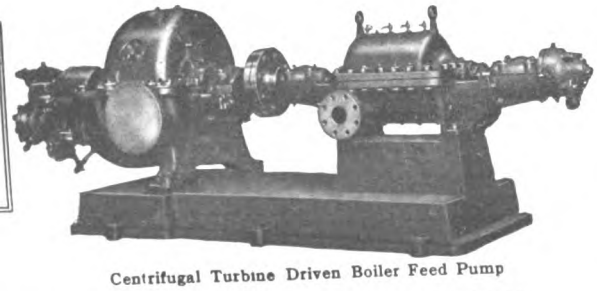
for Boiler Feed
—for Fire Protection

Both uses require absolute reliance and dependability. It is because of their efficient, economical service under all conditions that MORRIS CENTRIFUGAL PUMPS are specified and why over 65 Thousand of various types and sizes have been installed in the past 58 years.

MORRIS PUMPS require small space and minimum attention.

Write today for information.

Since 1864
Builders of
Dredges, Centrifugal Pumps and
Steam Engines



Centrifugal Turbine Driven Boiler Feed Pump

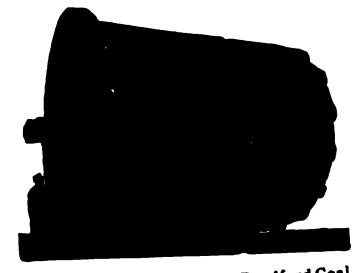
MORRIS MACHINE WORKS
200 Genesee St., Baldwinsville, NEW YORK

a gift which man must use sensibly and to the full of its potential benefits. We have even begun to question the rightness of our present paths from natural resources to delivered power; to wonder, as our knowledge increases, whether there is not a more economical path. The real problem is to find the shortest, most efficient path from these resources—oil, coal, water (and some perhaps as yet undiscovered source of energy)—to power for the use of mankind. And when we assume that broader viewpoint toward oil, it leads us along a different path from the coal path. We know of no practical way to release coal's energy for power, except by generating steam. Oil, on the other hand, offers another path to the real goal, which is *power*—the internal combustion engine. It is our purpose to take up in succeeding articles the present state of progress and accomplishment of the so-called Semi-Diesel engine and of the radically different Diesel engine; to show what these types have done and are doing as a contribution to the power needs of industry. Because no consideration of oil—as a source of power—would be complete without taking in the very real and important accomplishments of this type of prime mover.

"WE make too much of the idea that 'modern industry has destroyed the personal relations.' It is full of personal relations, at every turn and in every hour of the day, but the points of contact have shifted. One might suppose that industry runs itself, by some malevolent guidance of blind force. It is, in fact, ourselves at work. It is none the less human in every pulse and breath because there are ten thousand of us at work in a common enterprise instead of twenty-five. All through the process the individual workman, if he is not in contact with the stockholder or the director or the general officer, is at any rate in contact with someone in the directing capacity who stands to him in the relation of stockholder or director or general officer."—Hayes Robbins, in *The Making of Tomorrow.*

PUZZLING
Reduction Problems Occur in Almost Every Industry

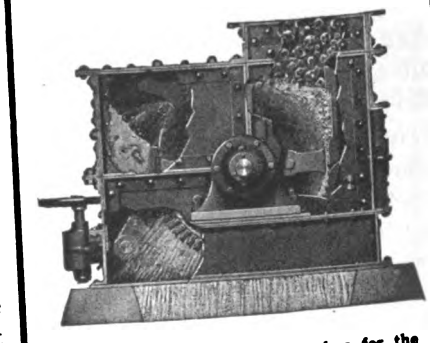
"Pennsylvania" Crushing and Pulverizing equipment has been specialized for crushing and cleaning Bituminous Coal for Power, Gas and Coking purposes, and for the primary, secondary and fine crushing of Cement Rock, Limestone, Gypsum, Ores, Sinters, Chemicals and other Materials of similar structure and hardness.



"Pennsylvania" Patented Bradford Coal Breaker and Cleaner for Coal Mines, By-Product Coke Plants, Central Stations and Gas Works.



"Pennsylvania" Single Roll Crusher for Industrial Power Plants, Gas Works and Coal Mines, in tonnages 10 to 500 tons hourly. (Patented.)



"Pennsylvania" Hammer Crusher for the fine reduction of Limestone, Cement Rock, Oyster Shells, and similar materials. (Patented.)

"Pennsylvania" Crushing and Pulverizing Machinery is distinguished by powerful steel construction, liberal proportions and thorough tramp iron protection, and is specialized for continuously delivering the specified quantity and quality of product in each class of service attempted.

Put your knotty reduction problems up to us.

PENNSYLVANIA CRUSHER COMPANY
Stephen Girard Building, PHILADELPHIA
NEW YORK PITTSBURGH

Digitized by Google

Users Can Tell Why Our September Business was so good

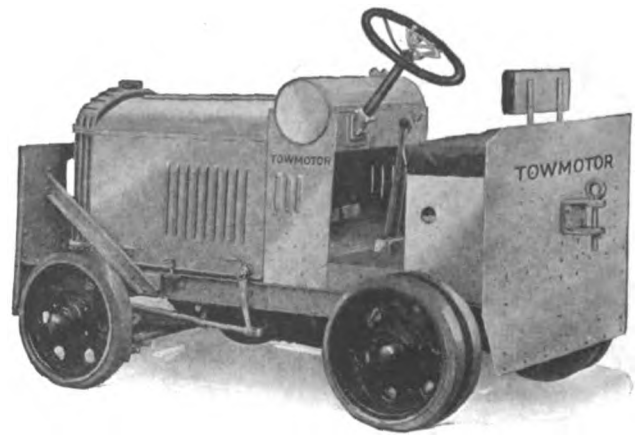
The National Malleable Castings Co.,	Cleveland, Ohio
Chase Metal Works,	Waterbury, Conn.
The Rail Joint Co.	Troy, N. Y.
The Wilmington Compress & Warehouse Co., Inc.,	Wilmington, N. C.
Appalachian Corporation,	New Orleans, La.
Chas. F. Felin & Co., Inc.,	Philadelphia, Pa.
Merritt Lumber Yards, Inc.,	Reading, Pa.
Norfolk Warehouse Corporation,	Norfolk, Va.
The Peerless Motor Car Co.,	Cleveland, Ohio
The Chandler Motor Car Co.,	Cleveland, Ohio
The Cleveland & Buffalo Transit Co.,	Cleveland , Ohio
The Newton Steel Co.,	Newton Falls, Ohio
Henry Disston & Sons, Inc.,	Philadelphia, Pa.
American Dock Company,	New York, N. Y.
The Cutler Hammer Mfg. Co.,	Milwaukee, Wis.
The Draper Manufacturing Co.,	Cleveland, Ohio
Rock Island Sash & Door Works,	Rock Island, Ill.
Ball Brothers Glass Mfg. Co.,	Muncie, Ind.
The Mechanical Rubber Co.,	Cleveland, Ohio
American Steel & Wire Co.,	Cleveland, Ohio
The Lorain Castings Co.,	Lorain, Ohio
Kurz Brothers Lumber Co.,	Chicago, Ill.
The Van Dorn Iron Works, Co.,	Cleveland, Ohio
The Aluminum Co., of America,	Massena, N. Y.
Stafford Mayer & Co., Ltd.,	Port Louis, Mauritius Island
Western Transport Company,	Liverpool, England
Christian Fredriksen,	Sydney, N.S.W., Australia

"We have full satisfaction with the TOWMOTOR and IT HAS NEVER FAILED to do any work we have found for it. It was especially helpful for us in moving our stock during the heavy snows of last winter."

"Each TOWMOTOR is doing the work of at least THREE OF OTHER TYPES. The low upkeep is remarkable in face of the fact that the TOWMOTORS are kept busy hauling loads of ingots as much as TEN TON in weight."

"We wish to state that the TOWMOTOR has PROVED SATISFACTORY, and we hope that business conditions will soon permit us to MAKE A CHANGE OF ALL of our equipment."

"Your Model A TOWMOTOR pulled a heavy trolley loaded with one hundred bags of sugar, gross weight of TEN LONG TONS, *up a gradient of one in four*. We started the load on low gear, then changed into second and passed the hill into top gear. The MOTOR TOOK TO THE WORK VERY KINDLY WITHOUT LABORING IN THE LEAST."



"We have come to the conclusion, after a thorough investigation of other tractors, THAT YOU HAVE THE BEST MOTOR ON THE MARKET suitable for our business, and have decided to GIVE YOU AN ORDER FOR TWO MORE OF THESE TOWMOTORS, to be shipped to us at once. The order for these motors is enclosed."

"We are mailing you our check for a Model A TOWMOTOR which is doing work for us that no other tractor has been able to do. The upkeep of TOWMOTORS is MUCH LESS than any other type of machine that we have used. In gasoline and oil consumption we found upon test that the TOWMOTOR effects a saving of *twenty to twenty-five cents per hour* over the ————."

"We purchased five TOWMOTORS after a careful survey of the different types of makes of gasoline tractors, but not from a question of first cost. We felt that the TOWMOTOR is a HIGH GRADE MACHINE, and built ALONG MUCH HEAVIER LINES than some of the other makes, and in the end would prove the *better investment*; and from our experience so far, do not think that you would make a mistake in selecting a machine of this type."

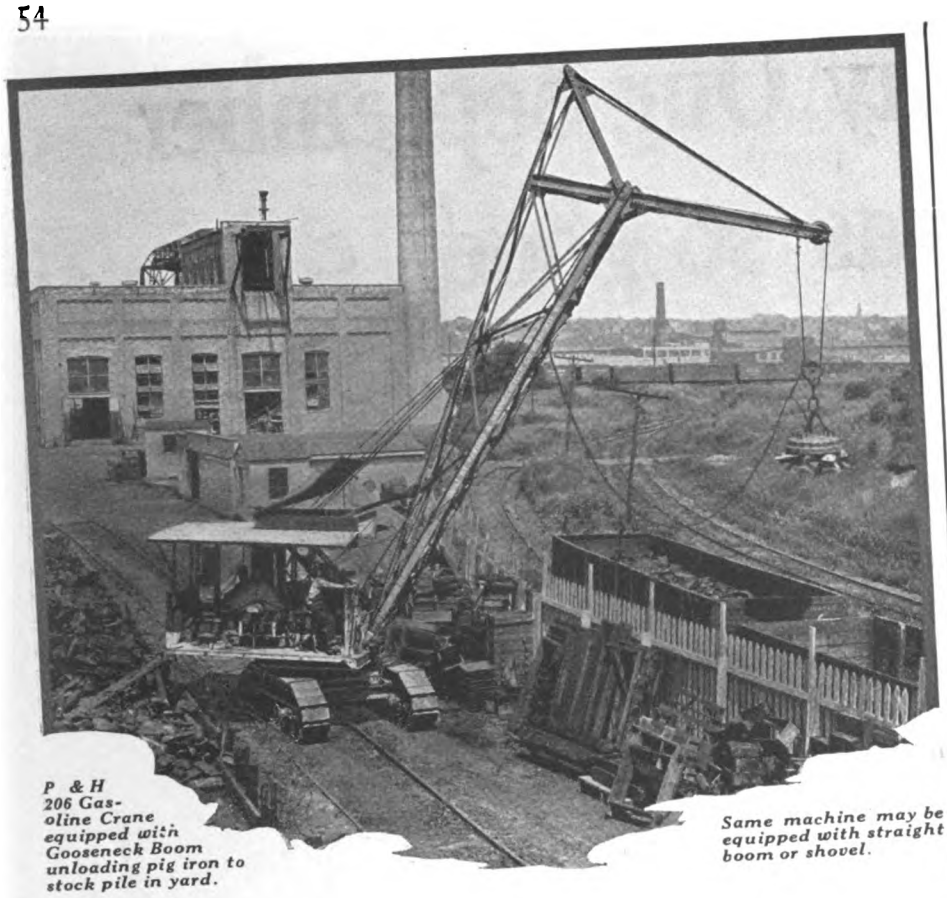
THE TOWMOTOR COMPANY

1226 East 152nd Street **Cleveland, Ohio**



THE TOWMOTOR

Digitized by Google



P & H 206 Gasoline Crane equipped with Gooseneck Boom unloading pig iron to stock pile in yard.

Same machine may be equipped with straight boom or shovel.

The P & H Has Unlimited Usefulness

The usefulness of the P & H Gasoline Corduroy Crane in any industrial plant is almost without a limit.

Equipped with a crane hook it can be used for loading and unloading machinery, handling structural materials, castings, flasks, etc. By hooking on a magnet the crane is used for handling pig iron, scrap or any magnetic materials.

With a clam shell bucket it handles moulding or core sand and coke at the foundry or coal at the power house.

Because no track is required the machine can be used in any part of the plant. Since there is no objectional smoke, the crane may be used indoors as well as out doors.



P & H 206 Crane with Gooseneck Boom operating in 18 foot aisle taking lumber off 20 foot piles and placing on wagons and trailers. The package handled consists of 1500 square feet of hardwood.

The wide range of usefulness and mobility of this machine combined with its low fuel consumption, one man operation and ability to start and stop instantly assure a constant return on the investment even in small plants.

PAWLING & HARNISCHFEGER CO.

Established in 1884

3850 National Ave., Milwaukee, Wis.

New York, Pittsburgh, Phoenix, Los Angeles — Chicago, Philadelphia, Denver, Salt Lake City — St. Louis, Birmingham, New Orleans, San Francisco — Portland, Seattle, Atlanta

P&H GASOLINE CRANES

The Making of Watch Crystals Now An American Industry

(Continued from Page 25)

of machine designs, to the point where most of the various operations are performed by semi-automatic machines. The custom in foreign manufacture is, or was, to do many of the various operations by hand. American inventiveness has provided machines, designed as the infant industry developed, to take the place of this costly hand method.

It might be here stated that another obstacle cropped up when the new industry was fairly under way. This was Japan. In 1915 Japanese exports to the United States in watch parts were around $96. This represents crystals. In 1918 they amounted to some $300,000; also practically all crystals. However, this class of crystals proved more or less unsatisfactory. The Japanese had not mastered the art of making clear, flawless crystals. They showed a tinge of straw color, and were unsuitable for the high grade watches.

During the early period of the struggle, the concern expended over a half million dollars in experimenting and learning how. Today they have a daily capacity of 800 gross of crystals, of all sizes and designs used in the trade.

This is despite the fact that it takes one and one-fourth crystals processed to produce one finished article, due to the rigid inspection and the breakage during the various operations. In the beginning, the proportion was two and six-tenths crystals processed to one finished and passed.

It must be borne in mind that watch crystals as applied to high grade watches must have a flawless finish, be perfectly clear and colorless, and be gauged to thickness and diameter. As in any working of glass, many complications occur in its melting, blowing and forming.

The base of the glass used is silicate rock ground to about the fineness of sea sand. This silicate is secured from Pennsylvania. To this are added lead, alkalies and various oxidizing agents that experience has proven necessary. This compound is used with an equal amount of cullet, or glass that has been previously compounded and melted. This latter is the remains of previous batches that have been already blown.

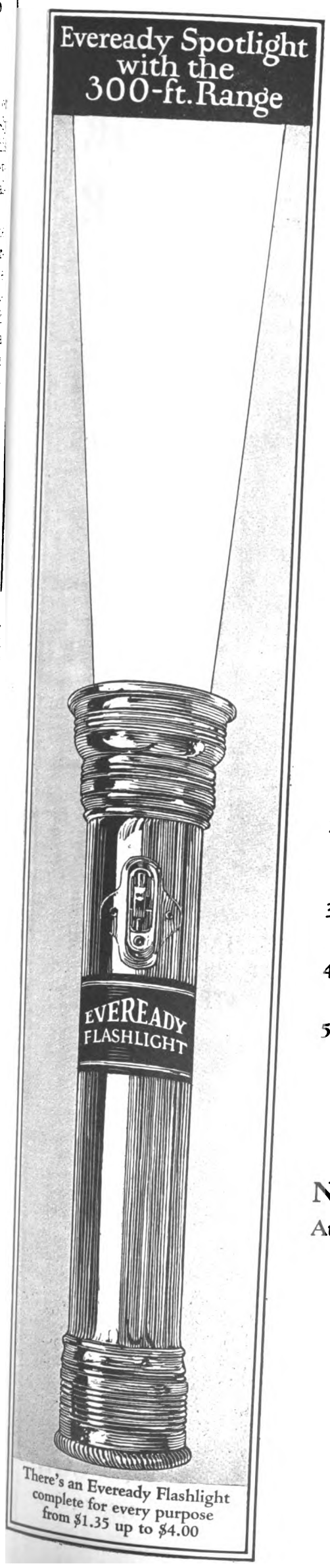
The compound that forms the glass is melted in huge covered pots formed of clay. The pots weigh approximately 3,000 pounds. They hold a batch of about 2,400 pounds at a time. The pots are made from imported clay and are received unbaked. The crucible is preheated five or six days in a temperature of about 1,800 degrees. This is to bring it gradually up to its working temperature. It is then transferred to another furnace where the material is added from which the glass is formed. It takes about eighteen hours at an even temperature of 2,400 degrees to melt the compound. The glass is ready then to be blown. This pot will last from one to several weeks and then must be discarded. It all depends on how the pot withstands the intense heat.

The molten glass is gathered on the end of a blow pipe and blown free-hand. No molds are used, as contact with the mold would be liable to cause imperfections in the globes formed. The blower blows by mouth to start the sphere he desires to form. The pipe is then laid on a horizontal rail and the mouth end shoved into the opening of an air line. The blower then sits on a small bench, his foot on a pedal that controls the air, and rolls the pipe back and forth on the rail until an almost perfect sphere is formed. They are blown to ten and twelve inch diameter.

The resulting product is a globe of clear colorless glass of the thickness necessary for the crystals to be formed from it. This thickness, however, is not strictly uniform. The globes run somewhat thicker at the end where attached to the pipe and thin at the further pole. The intermediate glass forms the crystals and also proves slightly variable. The globes are blown with a surface finish, highly polished from the heat, and if passed are free from bubbles, streams,

(Continued on Page 56)

Digitized by Google



Eveready Flashlights are as necessary in a factory as a watchman, a sprinkler system, or a fire alarm!

Eveready's advantages are endless. Following are a few of the best—

1. **Lighted instantly**—much quicker than matches
2. **Flameless**—no fire risk
3. **Steady**—unaffected by wind or rain
4. **No wires**—no connections to make
5. **No cord**—nothing to catch in machinery
6. **Concentrated light**—a bright electric beam directly where you want it
7. **Handy to carry**—much smaller than a lantern

Specific Uses for Eveready Flashlights in factories

1. **Indispensable in stock rooms**—to read labels on barrels and boxes in dark corners, on shelves, in drawers
2. **Accurate reading of measurements**—temporary measuring devices set up in odd corners are easily read with Eveready Flashlights
3. **Easy reading of counters**—always convenient, often necessary
4. **Quick Repairs**—often made on the spot, avoiding removal of machine to the shop
5. **For the company physician**—he uses specially designed flashlights for the examination of eye, ear, nose, and throat
6. **Inspection of equipment**—sprinkler heads and other appliances can hardly be thoroughly inspected without a flashlight
7. **Where inflammable liquids or gases are**—flashlights are recommended by the Bureau of Explosives as the perfectly safe lights; **no** sparks—no flame
8. **For the night watchman**—every watchman should, of course, be equipped with an Eveready Flashlight

For brighter light and longer service, always use Eveready Flashlights filled with Eveready Unit Cell Batteries

Write to our nearest address

NATIONAL CARBON COMPANY, INC., Long Island City, N. Y.

Atlanta Chicago Cleveland Kansas City San Francisco

EVEREADY
FLASHLIGHTS
& BATTERIES

Digitized by Google

TRUSCON
STANDARD BUILDINGS

TRUSCON STEEL CO.

Four Definite Savings

1—Cost less than other permanent buildings.
2—Quick erection insures earlier occupancy.
3—Small investment reduces carrying charges.
4—100% salvage when re-erected elsewhere.



Factories—From the smallest shop to the complete plant. Prominent users include: American Can Co., Baldwin Locomotive Co., Bayer Chemical Co., Postum Cereal Co., U. S. Aluminum Co.



Warehouses—Of size and arrangement to fit exactly all needs. Used by hundreds of leading companies including: Packard Motor Car Co., Swift and Company, Warner & Swasey Co.



Foundries—Well ventilated, fireproof and permanent. Users include: Allyne-Ryan Foundry Co., American Car and Foundry Co., Camden Forge Co., Dayton Malleable Iron Co.



Oil Buildings—Used for fireproof oil storage, filling stations, compressor houses, bulk stations etc., by such companies as: Atlantic Refining Co., Galena Signal Oil Co., Standard Oil Co.



Railroad Buildings—Used as shops, freight and express sheds, tool storage, bunk houses, waiting rooms, etc., by many railroads including: Chicago and Northwestern R. R., New York Central R. R., Pennsylvania R. R.,

Tell Us Your Problem

and we will quote you a price on a building erected, sure to meet your needs exactly—

Remember, the purchase price of these buildings consists only of our factory cost plus one overhead plus one profit. Write today.

TRUSCON STEEL CO.
YOUNGSTOWN, OHIO

Memo to write to Truscon Steel Co., Youngstown, Ohio, telling them our building problems

(Continued from Page 54)

lines, or discoloration. They look very much like a finished product, even in this first operation. The blower frees his pipe from the globe by running a pair of wet tongs around the neck, close to the pipe, and releasing it by a slight tap. The globes are then placed in a rack, set on the floor, to cool. The blower then repeats the operation until the quantity workable is taken from the pot.

One-half of the contents of the pot is used, and two pots are run off a day. The remainder of the material does not work up successfully and is discarded for the time being. This is done by ladling the melted glass into a huge iron caldron full of water. This cools the glass, which breaks up into fragments that range from the size of a walnut down to minute pieces. These fragments are ground up and form the cullet which enters into the formation of another batch, as previously described.

The globes now go to a cutting bench where they are split in two halves. This is done by inserting a curved glass cutter through the opening where the blow pipe was attached, and scoring a line about an inch long toward the opposite hole. A slight tap breaks the glass in line with the cut, and a further tapping around the surface of the globe divides it neatly. This latter operation is a knack that took a long time to master. Thousands of globes were shattered beyond use before the operator was enabled to do it efficiently.

It might here be further stated that the Company was forced to train their help from the very beginning. Intelligent factory labor was taken in and painstakingly instructed. The force learned as the staff overcame obstacles and educated them to the knowledge and experience gained.

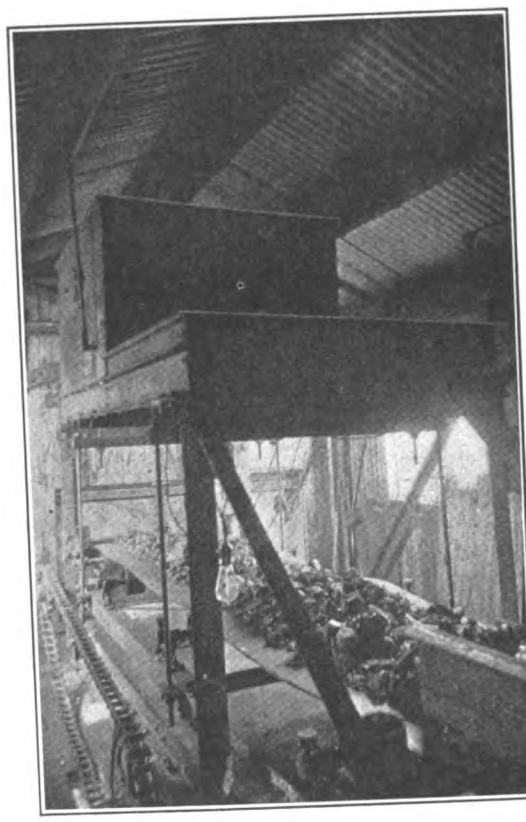
This lack of help also extended to the glass blowers. There are few free hand blowers in the country today, and those capable of blowing the quality glass suitable for watch crystals are rare. Mere glass blowing won't do. Watch crystal blowing is required.

After splitting, the halves go to a machine where the crystals are cut from these sec-

(Continued on Page 59)

SAVE TIME AND LABOR
Use The
MERRICK CONVEYOR WEIGHTOMETER

Any material which is conveyor handled can be weighed without additional handling or loss of time by the Merrick Weightometer.

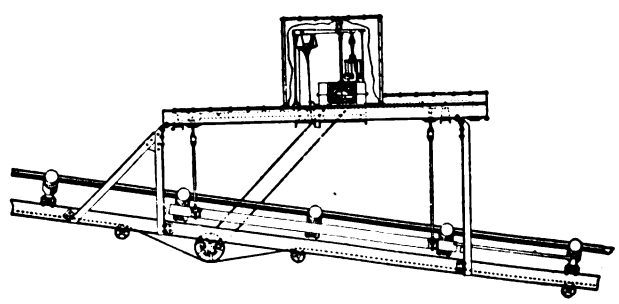


TYPICAL INSTALLATION MERRICK WEIGHTOMETER

Hundreds in use weighing all classes of materials such as

coal, run o'mine and crushed.
Coke
Stone, coarse and fine.
Gravel.
Sand.
Cement Rock.
Cement Clinker.
Metallic Ore.
Phosphate Rock.
Phosphate Pebbles.
Wood Chips.
Sulphite Pulp slabs.
Fish and Fish Products
Finished Cement
Zinc Ore,
Iron Ore.
Copper Ore.
Lead Ore.
Gold Ore.
Silver Ore

NO WEIGHMAN OR ATTENDANT REQUIRED
GUARANTEED AND PROVEN 99% ACCURATE



Method of Installation

Why rely on Bill of Lading Weights?
Why not be able to tell exactly how much material you receive?
Hundreds of concerns buy and sell their products using Merrick Weightometer weights.

For Information Write

MERRICK SCALE MFG. CO.,
180 Autumn Street
PASSAIC, N. J.

Digitized by Google

To Executives who know the value of TIME—

Keep your business at your finger tips by being in *instant* communication with all departments.

Ask us to demonstrate the money-saving value of Callophone Service right in your plant, anywhere within a hundred miles of New York.

Hundreds of leading industries are now using it, and testify to its indispensability.

Write for details.

CALLOPHONE

CALLOPHONE COMPANY
OF NEW YORK
Cor. Grand and Lafayette Streets
New York

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width	$10.68
9½ " "	11.93
11½ " "	14.00
12¼ " "	15.45
13 " "	16.00
14 " "	17.59
15 " "	18.84
18 " "	22.00
18¼ " "	22.90
24¼ " "	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. ***Our Customers will benefit.***

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company

(An Independent Corporation)

ROCHESTER, N. Y.



G-W Coal and Ash Handling Equipment at Chandler Motor Car Co., Cleveland, Ohio.

BUILT Stronger - Lasts Longer—ruggedly built to keep maintenance and replacements down to rock-bottom. Many G-W Equipments have been operating for years without a cent of repairs.

If you're contemplating the erection of a new power plant or additions to an existing plant, you'll be interested in the money-saving features of G-W Coal and Ash Handling Equipment.

Such power plants as the Chandler Motor Car Plant pictured above, the Manhattan State Hospital Plant, Ward's Island, N.Y., and other representative plants throughout the country, present concrete evidence of the "Built Stronger—Lasts Longer" advantages of G-W Equipment. A Gifford-Wood representative would like to give you complete details.

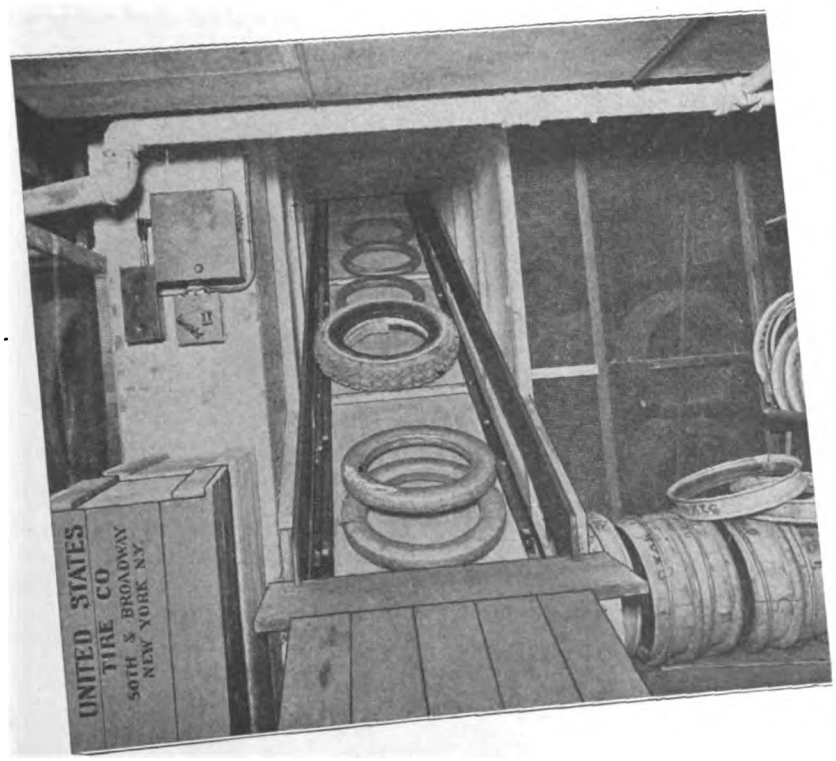
Main Office and Works: Hudson, N.Y.

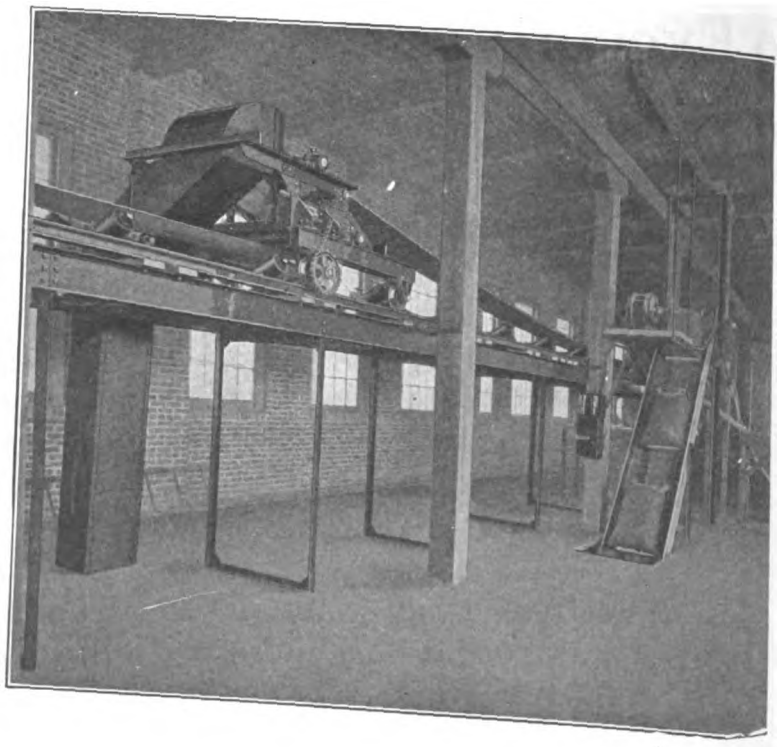
New York Chicago Boston Buffalo

Gifford-Wood Co.

COAL HANDLING EQUIPMENT

Digitized by Google





If you have material to handle CONVEY it and reduce costs

THERE is no phase of your business that thwarts production and increases cost of your product more than careless methods of handling material. Moreover the morale of your plant organization is largely dependent upon how you handle material in the various stages of manufacture.

Visualize, if you will, the effect upon your employees and the resulting economies of a Conveying System designed to meet your individual conditions, that automatically carries material from operation to operation, or packages from any number of departments to packing or shipping department. You will readily admit that production can be increased with your present organization, that your costs will be consistently lowered and that your sales will be substantially increased.

The type and cost of Conveying System for your requirements depends entirely upon your problem. Every Conveying System more than justifies the expenditure. Give us an opportunity to analyze your material handling problem without your incurring any obligation. It may be that you require but a few sections of Gravity Conveyor to solve existing problem or that a comprehensive Conveying System is necessary in order that your material handling be placed on a consistent basis.

Our analysis costs you nothing. Write and arrange appointment with our conveyor engineers.

SAMUEL OLSON & CO.

Loose, Bulk and Packed MATERIAL HANDLING SYSTEMS

2418-26 Bloomingdale Ave.
CHICAGO, ILLINOIS

5th Ave. Bldg.
NEW YORK, N. Y.

Digitized by Google

(Continued from Page 56)

tions. The radius of these halves forms the curvature of the finished crystals in the lower priced watches. They are known as Miconcave, as contrasted to Empire, Lentilles, and Genevas, which classify the higher grades. The Lentille is a specially formed high grade crystal that is used on expensive watches. Genevas are a thinner model, Empires a medium grade.

The machine that does the cutting is a simple bench affair worked by hand. It consists of an upright pedestal and extended arm through the end of which drops a vertical bar. At the bottom of this attachment is a horizontal bar holding a glass cutter at the end. This bar is adjustable. It can be arranged to scribe a small circle for wrist watch crystals, or extended to form the larger sizes.

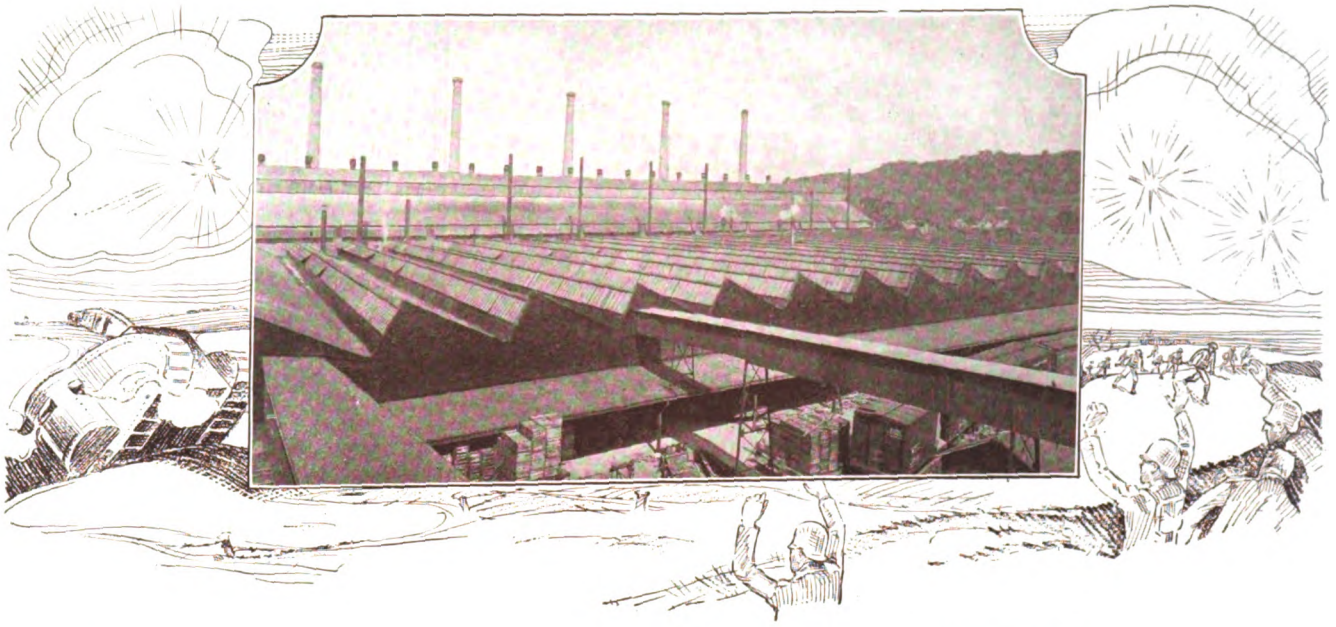
The operator holds down with a slight pressure on the vertical bar and scores a circle with the cutter. This is repeated until the half globe, or portion of a half, is filled. A slight tap frees the blanks thus marked.

There is now a round crystal, fully polished on the surface, with approximately the diameter desired, and with the convex surface sought if to be used on low priced watches. These cut out crystals now pass along an inspection bench and are inspected for flaws before succeeding operations are performed. They are gauged for thickness by a dial gauge, divided to read thousandths of an inch. The crystal is placed between the indicating plunger of the dial and an anvil below. The reading is somewhat on the principle of a micrometer caliper. The crystals are placed in several piles as they are gauged, which are later graded for various uses.

The next inspection is for perfect flatness of the edges. It is obvious that the blowing does not form a perfect sphere, nor the cutting out of the crystals work uniformly. The crystal is laid on a small square of glass and if it rocks it must be reheated and leveled in a press, which levels the edges. About forty percent prove accurate; the remainder must undergo the further treatment.

This flattening is done on a type of machine that is formed somewhat on the style of the cutting device. In this operation the crystals are placed in a small mold or die and placed in a muffle. All reheating is done in muffles as direct flames would discolor the glass. When properly heated the molds are removed and placed under a plunger or forcer worked by hand. This is pressed down on the crystal and levels the edges. The crystals are then annealed to prevent tension strains.

Another reheating and pressing operation is performed on the higher grade crystals. Crystals formed from the blown globe, as stated, are mostly for low priced watches and the globe curvature is satisfactory. The finer crystals are placed in molds as in the



Over the Top

The zero hour approaches. Conversation drops to whispers. It dies out altogether. A moment or two, and then—over the top! . . what fate awaits?

Day after day, year after year is zero hour for the roof of a building. Destruction sneers at it continually. Rain and snow beat down on it, the sun scorches with its burning rays, fire joins the constant struggle. And still the roof endures *if it is constructed of Bonanza "Cementile."*

Over the top!—Bonanza "Cementile" knows no dread of the unending zero hour all roofs must face. The elements are impotent, fire cannot injure, for a Bonanza "Cementile" Roof is impervious to these forces of destruction.

Send for our illustrated catalogue.

CEMENTILE

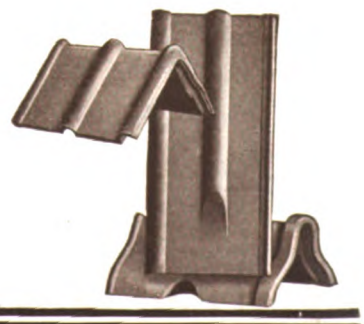
Bonanza "Cementile" is a reinforced cement tile roofing, with a pleasing outer surface, laid directly on the roof purlins. It is light, but very strong in structure and abolutely fire proof and waterproof. Made for flat or pitched roofs, new or old.

CEMENTILE

The first cost of a Bonanza "Cementile" Roof is the last cost. We make and lay the roof, and unqualifiedly guarantee the material and labor.

BONANZA—CEMENTILE

American Cement Tile Manufacturing Co.
831 Oliver Building, Pittsburgh, Pa.
PLANTS: Wampum, Pa. Lincoln, N. J. · Birmingham, Ala.
OFFICES: Pittsburgh · New York · Philadelphia · Cleveland · Birmingham



Digitized by Google

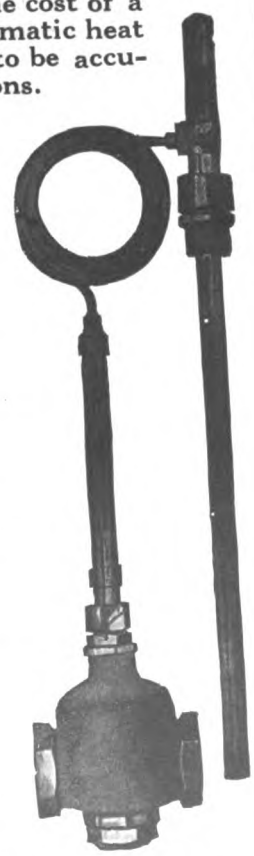


Why Gauge Temperature By Guess?

THE MAN trying to watch and control temperature may keep it right four times out of five—perhaps nine times out of ten—but sooner or later he is sure to slip up—and every time he does, a batch of expensive material is either spoiled or damaged.

Why depend on mere guessing—on hit-or-miss uncertainty, when you can have absolute *certainty?*

A single batch of spoiled material, a single process gone wrong through the uncertainty of guessing, will frequently amount to several times the cost of a Sarco Temperature Regulator—an automatic heat control that is absolutely guaranteed to be accurate and dependable under all conditions.



Entirely self-contained and self-operating—operated by the simple and sure expansion and contraction of an extremely sensitive *liquid*. Instantly responsive to the slightest variation in temperature—and always positive and certain in its action. No electricity, no compressed air or water, no outside attachments or outside aid of any character.

Because of its simplicity, its elimination of complicated attachments and other involved mechanism, it costs less than any other regulator—and is more easily installed.

Operates on gas, steam or hot water heat. Can be supplied to control temperature in any kind of manufacturing process—including the most delicate. Also for control of room temperature, hot water temperature, etc.

Sold on 30 days' free trial—if not satisfactory, simply return it and it costs you nothing whatever.

For further information, write for Booklet No. R-57.

SARCO CO., INC.
236 Broadway, New York City

Buffalo Detroit Chicago
Cleveland Philadelphia

SARCO
TEMPERATURE REGULATOR

preceding operation and formed to the shape desired. In this the crystals are flattened on the surface, and in fact are also pressed inside out. This results in a crystal with a flat surface and a curve or bend at the edges. The product is a crystal that will fit into a watch, be free of the hands, and yet show a flat face. Trade demands may require them to be flat, slightly convex, or of any degree of curvature in use.

The next operation is grinding. All crystals must be ground and polished on the edges. This is done on semi-automatic machines. The abrasive used is either pumice stone, or sandstone wheels. On the cheaper grades, or thicker crystals, the glass is placed between two centers or rubber tipped plungers, which are swung after the fashion of those on a bench lathe. These small lathes are mounted in series on a long machine base; one man taking charge of twenty machines. The crystal is held taut by spring pressure and is placed against a horizontal grinding wheel.

The action of the wheel, to which the edge of the crystal is held firmly by a tension arrangement, trues up the blank and grinds the edges on the necessary bevel. The ground bevel is formed by setting the centers which hold the crystal off on the angle desired. As soon as a crystal is ground to the proper diameter a small electric light over the machine goes out and an attachment throws the centers holding the crystal, away from the wheel. The operator then takes out the finished work and replaces it with another glass to be ground.

Another form of grinding, performed on the finer grade crystals, is done on a machine somewhat on the lines of the one described above. But this machine uses a vertical wheel which travels back and forth across the edge of the crystals. The action is similar to a cylinder grinder. Two crystals, held back to back between two centers, are ground at once. This is possible on account of the edges being ground straight, and a thinner crystal being used. The grinding on this type is to bring them to the proper diameter. Four thousandths is allowed as variation either way from the fixed size.

From this machine the high grade crystals go to another grinding machine, which forms a curved edge to the glass. As previously stated, this type, Lentilles, Empires, and Genevas, are pressed with a band at the edges. This band breaks rather sharply from the pressing operation and the second grinding is to form a graceful curve which merges into the flat or convex surface of the crystal. This grinding is done by attaching the crystal to the end of a tube, to which it is held by suction, and allowing the crystal to drop gradually down over the face of the grinding wheel. The descending motion, in connection with the circular movement of the crystal, forms the desired curve.

After this curve is formed it leaves the crystal with sharp bottom edges and dull sides. The edges at present are dulled by holding them against a sandstone wheel and slowly turning the crystal in the hand as ground. Machines are in process of construction to do this operation semi-automatically. It is now necessary to polish the dulled glass. This is done on buffing wheels, using red rouge.

The lower priced grades must also have the sharp edges removed and the bevel polished. This is done on an ingenious machine which works practically automatically. A finger picks up the crystals from a stack and places them one by one between an upper and lower dial pin which is set on a dial plate. The plate revolves horizontally and contains several sets of pins. The crystal is held between the two pins by tension, and trues itself by a guide set beside the revolving dial plate. As the dial circles, the crystal first rubs against a strip of emery cloth, which dulls the edges, and then works against a horizontal wooden wheel, flushed with pumice stone and water, where it receives the necessary polishing.

After polishing, the crystals receive the final inspection. They are then either placed in stock, shipped to the various watch manufacturers, or utilized in the local watch plant.

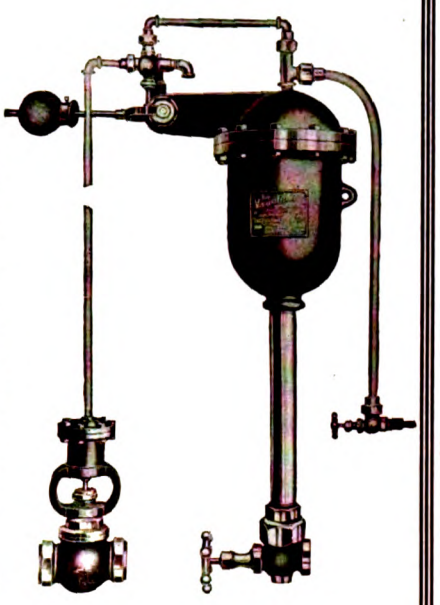
At present the company is making crystals that range from the smallest wrist watch

(Continued on Page 62)

Digitized by Google

Save Fuel and Make the Boilers Safe

Install a Vigilant Feed Water Regulator



and keep the water-level within one-fourth inch of center-gauge regardless of the load or method of firing.

The Vigilant has no floats, no complex system of levers, toggles and small valves, no concealed parts or obscure steam passages. Nor does it depend upon the uncertainty of expansion and contraction. FREE TRIAL.

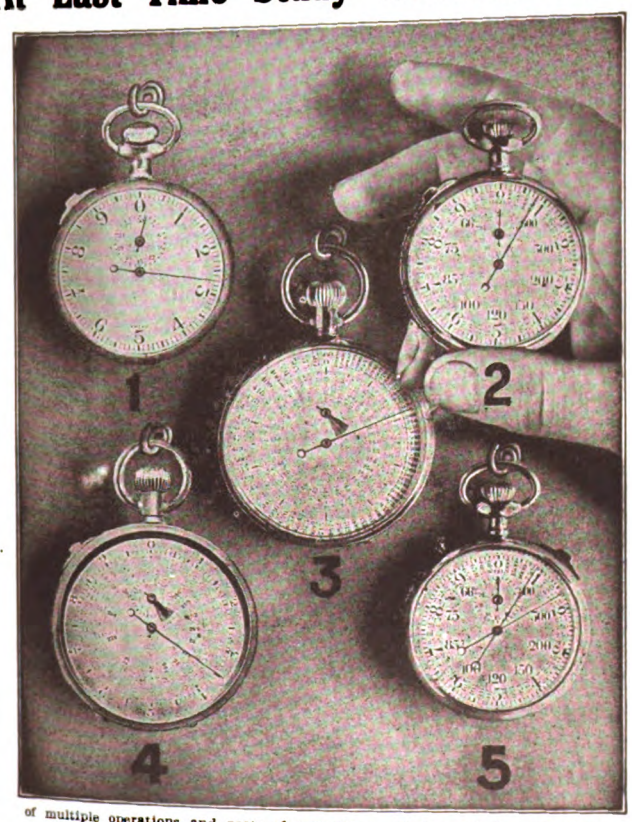
Write for free descriptive circular.

The Chaplin-Fulton Mfg. Co.

28-36 Penn Ave. **Pittsburgh, Pa.**

Also Manufacturers of the Fulton Pump Governor, Tank Governor, Reducing Value and Other Steam Specialties

At Last Time Study Watches for Every Job



At last time study watches have been developed to where they can apply to every job in the plant—do their own calculating for production figures—give you direct results with absolute accuracy. Your job may be a simple time analysis—or a complex problem in piece work rate setting or a bonus system—there's a watch in this illustration that exactly fits your needs.

For Locating Wastes
Computing Costs
Setting Rates for Piece Work
Establishing Bonus Plans

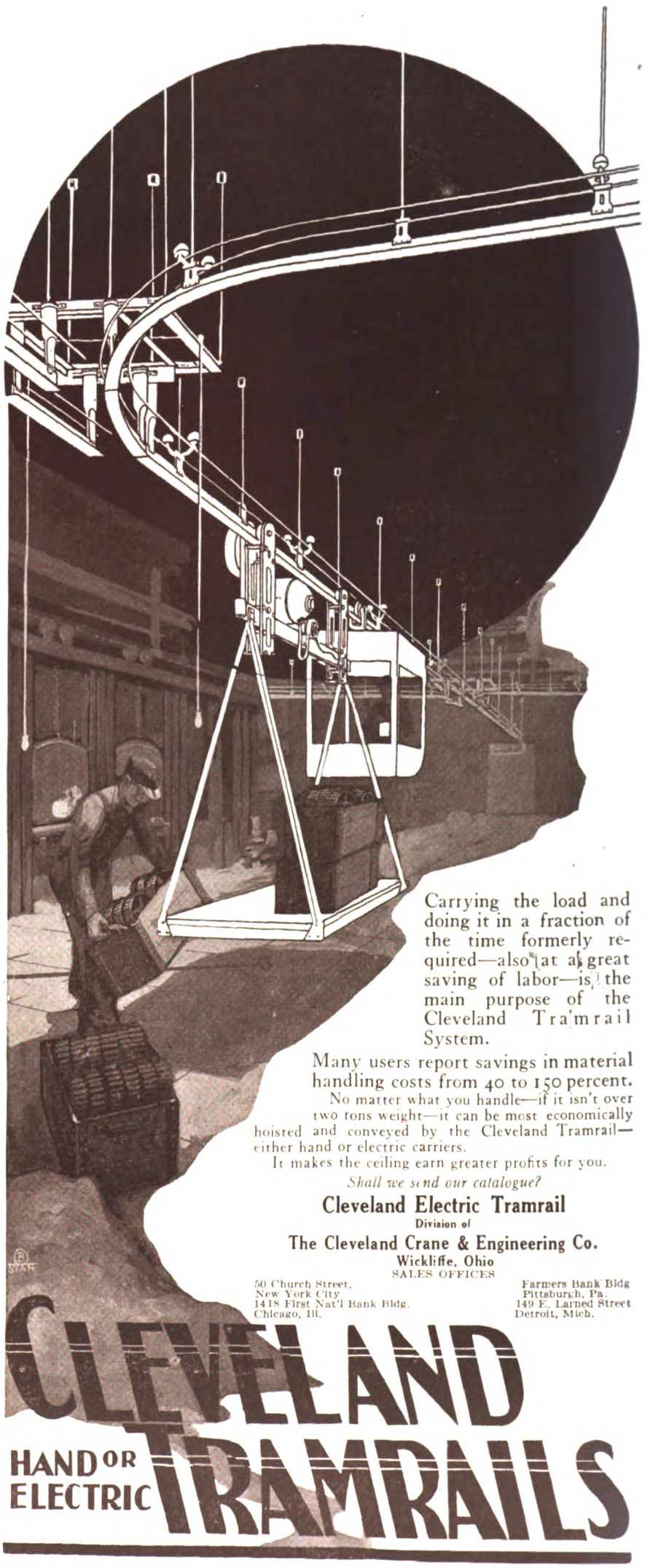
You can use any one of these watches for every kind of time study. But each has special features that facilitate certain types of work. No. 1 has a plain decimal dial with the "take out time" feature. No. 2 has, in addition, direct readings in production per hour up to 1 minute jobs. No. 3 carries the same readings up to 5 minute jobs, in seconds and half-seconds. No. 4 gives all readings in decimals and shows production figures up to 3 minute jobs with a special arrangement for timing jobs up to 30 minutes. No. 5 is the "split hand" watch with the "take out time" improvement which now permits careful studies of multiple operations and parts of operations. Each watch has this "take out time" feature.

Any Watch Sent on Approval to Responsible Concerns

Pick the watch that fits your job. We will gladly send it with a descriptive pamphlet on its use to any responsible concern on approval. Put it to any test you wish—prove its advantages in facilitating the work and guaranteeing absolute accuracy. Each watch is backed by our unlimited guarantee. Write us today for the instrument that fits your requirements—or in case you desire our advice, tell us the class of work you are doing and we will ship you the watch to meet your needs. No obligation. Write today for detailed pamphlets, or for pamphlet entitled "More Jobs for the Factory Stop Watch."

MORTIMER J. SILBERBERG CO.

Peoples Gas Bldg. Pioneers in Manufacture and Sale of Time Study Watches **Chicago, Illinois**



Carrying the load and doing it in a fraction of the time formerly required—also at a great saving of labor—is the main purpose of the Cleveland Tramrail System.

Many users report savings in material handling costs from 40 to 150 percent.

No matter what you handle—if it isn't over two tons weight—it can be most economically hoisted and conveyed by the Cleveland Tramrail—either hand or electric carriers.

It makes the ceiling earn greater profits for you.

Shall we send our catalogue?

Cleveland Electric Tramrail

Division of

The Cleveland Crane & Engineering Co.

Wickliffe, Ohio

SALES OFFICES

50 Church Street, New York City
1418 First Nat'l Bank Bldg. Chicago, Ill.
Farmers Bank Bldg Pittsburgh, Pa.
149 E. Larned Street Detroit, Mich.

CLEVELAND HAND OR ELECTRIC TRAMRAILS

Digitized by Google

Underlying All Wage Systems

Whatever you base wages on, you mean fundamentally to pay on a merit basis; a *production* basis. The problem is, how best to appraise your worker.

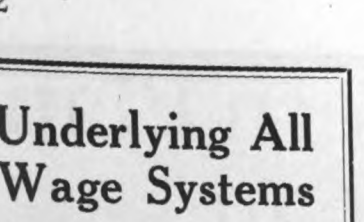
Veeder Counters give you, automatically, the most accurate measure of an operative's value that can be had—just as they give you the most accurate measure of the product of any particular machine.

From the heaviest punch press to the nimblest wrapping machine there is a suitable

Veeder COUNTER

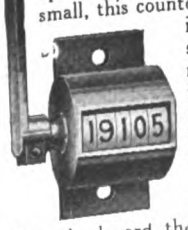
to check up the worker's production, make him look to his output and make sure he's worthy of his wage.

The Set-Back Rotary Ratchet Counter below is for machines such as punch presses and metal-stamping machines, where a *reciprocating* movement indicates an operation.



Registers one for each throw of the lever, and sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figures, as illustrated, $11.50—subject to discount. (*Cut less than ½ size.*) Set-Back *Revolution* Counter of similar model, $10.00 (list).

The small Revolution Counter below registers one for a revolution of a shaft, recording a machine operation, or product. Though small, this counter is very durable: its mechanism will stand a very high rate of speed, making it especially suitable for light, fast-running machines, and most adaptable for experimental work. If run backward, the counter subtracts. Price $2.00. (*Cut ⅗ size.*) Small Rotary Ratchet Counter, to register reciprocating movements of small machines, also $2.00.



You can get a "Veeder" for every machine where the pay should be proportioned to production; ask for the counter booklet.

The Veeder Mfg. Co.,
63 Sargeant St., Hartford, Conn.

(*Continued from Page 60*)

up to the largest timepiece. The manufacture of the crystals was simply for personal use, at first, but today several large concerns are buying U. S. made crystals for their high grade watches. The jobbing trade, however, is mostly handling the imported goods. The American concern is in a position to meet the demands of this latter market and is gradually extending operations. About five hundred hands are employed at present. This represents skilled help, fully trained for the work.

Regardless of the adeptness of the Japanese, and the renewal of large foreign imports, the work in the American watch crystal plant is being systematized and adapted to machine production. Every machine in the plant is an outgrowth of the experience and ideas of the executive staff. They are designed and manufactured at the Company's machine shops. They are models of simplicity, efficiency, and accuracy. They represent the reward of faith and perseverance over "It can't be done."

"WE are much in the habit of pointing with pride to our trade balances and factory output and crop reports, in evidence that all is well. It may be. Whether our prosperity is real and will last is all a question of what we are making of it in human welfare and power of self-control. It will not last if we do not distribute it fairly; it will not last if we merely spend our unaccustomed wealth in cheap indulgence and have not the power to assimilate it in wholesome growth."—Hayes Robbins, in *The Making of Tomorrow.*





What Secrets Do the Walls Conceal?

FORESIGHTED builders and investors are frequently more concerned about the things they cannot see about a building than in its outward appearance. One of their greatest concerns is the condition of the extensive arterial systems buried in walls and floors. If the pipe is Byers, they have the utmost assurance against future heavy repair expense, including extensive damage to walls, floors, rugs and furnishings.

Byers pipe is made of genuine old fashioned wrought iron, which is the only welded pipe whose dependability has been proved by past performance covering a period of over 60 years. It is made by the century-old hand puddling process, which gives to the metal a life far beyond that obtained from products of modern processes.

The diagram shows the average extra cost of Byers pipe in a pipe system to be about 7%. As against this small amount, the cost of replacements, if they became necessary, would be so heavy as to jeopardize the very investment value of the building.

In dwellings and skyscrapers, Byers pipe is the choice of all those who *know* materials. Ask your architect, engineer or contractor.

Byers Bulletin No. 38 "The Installation Cost of Pipe" sent free on request.

A. M. BYERS COMPANY, PITTSBURGH, PA.
Established 1864
New York Philadelphia Boston Chicago Cleveland Houston

BYERS PIPE
GENUINE WROUGHT IRON
Look for the Name and Year rolled in every length

Digitized by Google

Engineer Shoemaker of Western Plant Discovers Way to Cut COAL BILL in HALF!

Modern equipment—assumed full efficiency—yet the Hays Home Study Course in Combustion showed him how to save 113 tons of coal a month with an even bigger load. Will you give your Engineer this training in exchange for a similar saving?



May.....213 Tons
June.....139 "
July.....131 "
Aug.....100 "
BIGGER LOAD

DO you want to make such a saving in your plant? In the face of rising coal prices and a desperate shortage of fuel, will you consider a business like plan for cutting your coal bills? This is my suggestion.

The plant in question had every type of modern appliance and mechanical device for burning coal efficiently. Yet a new man comes in and saves 113 tons of coal a month—cuts the coal bill in half! Why? Because charts, gauges, automatic stokers, blowers and draft regulators cannot run a boiler room without the directing genius of mind that knows what every sign means, what to do in every case. Engineer Shoemaker was trained by the Hays School of Combustion. He had a fundamental and thorough knowledge of every phase of combustion, he knew how to inspire the men to more interest in their work and he knew *every short cut to more power for less money.*

500 lbs. From Every Ton is WASTED!

With all the modern appliances for saving fuel the average plant today is wasting 25% of every ton of coal. In short, you are paying the full ton price for only 1500 pounds of fuel.

Now, a question. If a man came to you and said, "Do thus and so and you will save $500.00 every month that your plant runs," and you investigated and found that he was right, would you be willing to pay him for his definite information? I think you would. You would be foolish if you didn't for every cent saved on fuel is clear profit-velvet.

How You Can Cut This Waste

Then, here is my plan. Will you allow me to take one man from your plant—the Chief Engineer, the Superintendent, or an apt fireman—and, without taking a minute of his time from the job, give him the training in his spare time at home that will enable him to make for you a saving similar to or even greater than that made by Shoemaker for his Plant? And will you pay for his training—less than a hundred dollars—with the understanding between you and me that, after he has finished the course, if you are not satisfied that this small investment will be repaid many times in actual profits, that I refund the money?

More Vital Than Money

This is not merely a question of saving coal when it is at its peak in price. It is more far-reaching than that. The coal shortage is so acute that hundreds of plants have been forced to shut down. Hundreds more have been cut to half time. The really vital question is "Will I be able to get enough coal at any price to keep my plant running?"

If the man you pick to have us train could—not cut bills in half—but just get the efficiency from that wasted 500 pounds—even then, you would be getting the power equivalent of 1½ tons from every ton you bought.

Is it worth trying? My offer is bona fide. I will train your man at my risk. Or, *I will train all your men.*

If Engineer Shoemaker were the only graduate Combustion Engineer who had made a saving like this for his company I could not make such an offer. What he has done is only a drop in the bucket. Read the records shown in the panel to the left.

Other Big Savings

Saves $540.00 a Month

"Without scales, feed meters or draft gauges to work with I have cut coal consumption from 15 tons a day to 9.2 tons, saving $540.00 a month." K. R. Williams of Charleroi, Pa.

Savings Quickly Noted

"Already I have made a saving recognized by more remuneration." F. E. Burgess of Philadelphia.

Fuel Efficiency Wins Recognition

"Have had two raises as a result of the saving I have effected since taking the Hays Course." Gordon Kelly, Cambridge, Mass.

$200.00 Saved Here

"In the last two months I have saved $200.00. At least 50% of this was in coal saved." William Weston, another student.

Cut Coal Bill 15%

"I have cut our coal bill 15%." Edw. C. Grove.

Saved 60 Tons in One Month

"Saved 60 tons of coal this September compared with same month last year." George W. Austin, Tuskagee, Ala.

Reduced Consumption 10%

"Have reduced fuel consumption 10%." L. B. Quam, of the Oil Belt Power Company.

FREE *Where Shall We Mail Your Copy of This Cost Cutting Book?*

The records shown are not remarkable when you consider the records of the men who prepared this course. Those whose experience is combined in this training are: Jos. W. Hays, well-known writer and consulting engineer; Prof S. W. Parr, of the University of Illinois,—authority on fuel chemistry; Fred R. Low, Editor of "Power"; David Moffat Myers, prominent consulting engineer and formerly of the Fuel Administration; Arthur L. Rice, Editor of "Power Plant Engineering"; W. L. Abbott, Commonwealth Edison Co., Chicago; I. E. Moultrop, Edison Elec. Illum. Co., Boston; and Jos. Harrington, stoker expert.

Any Man Can Learn How

This course in Combustion and Fuel Efficiency is so interesting, so clearly written that any man of ordinary intelligence—with no better than a common school education—can master it and become as good and as expert a Combustion Engineer as though he had spent four years at a technical school. From the very first lesson he learns principles and what is more important, how to apply them at once, in his daily work. This is true throughout the course.

Send Coupon Now

But what you are interested in is "How much fuel can I save?" Space forbids details. We have prepared a book which will give you the whole story, tell you all about the course and about the various plans now in use in America's leading plants for training the men to stop the hundreds of little leaks that waste coal. Paste the request printed below to your letterhead and mail it at once. The book will be sent free without cost or obligation.

HAYS SCHOOL OF COMBUSTION, Dept. 77
1412-14 S. Michigan Ave., Chicago, Ill.

Hays School of Combustion, Dept. 77
1412-14 S. Michigan Ave.,
Chicago, Illinois.

Send me your Book on Combustion without obligation.

Name.....
Address.....
City.....State.....
Company.....
Position.....

Digitized by Google

First Aid to Avoiding the Friction Due to Cutting Wages

Get This



(post paid on request on your letter-head)

These plan books come in 100 lots and they are sold to employers of Labor at 25c each, any excess over cost is applied to advertising. These books are retailed at $1.00 each to individuals in retail stores, book stores, drug stores, department store book departments.

WHEN INcome is reduced—the problem of living within it is increased—Advice from the employers who have cut the income IS never thought much of by the employee.

BUT—a practical plan showing HOW to budget that reduced income—a plan based upon ACTUAL and Liveable conditions—showing how to apply "Practical Thrift" to Living and Saving—to control OUTgo and INcome, the HOW is always gratefully studied—That's what we have worked out—NOT merely a book—NOT an accountancy system—but a PLAN of Home Budgets —Direct—USABLE.

Here it is, look it over.

It's endorsed by leading Bankers—Economists and business men everywhere.

Tell us how many you care to have to give or sell to your employees.

The cost to you will be nominal. It will cover our actual cost of production and compilation and every dollar over goes into further advertising IN YOUR LOCALITY OF THIS PRACTICAL THRIFT IDEA.

Help your employees, indirectly by showing them HOW to have and SAVE and still enjoy the little things that make life more than mere existence.

Get this First Aid to thrift—this Silent Partner of the individual. Write us a frank constructive criticism and say whether you care to help along this practical way to avoid discontent due to reduced incomes among the wage earners.

The man who plans or budgets his income so that he saves something out of what he makes is a more valuable employee than the spend-thrift.

This campaign helps to make ***better satisfied*** employees through practical education.

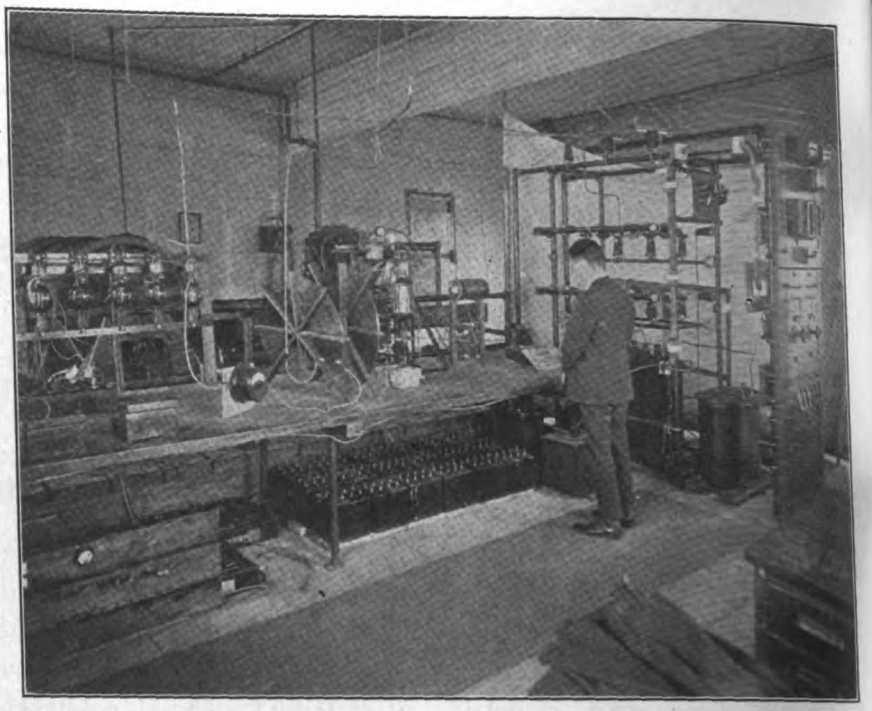
MENTER

Teachers of THRIFT Since 1889.

"Thrift Division"

Suite 2, 1419 Seventh Ave., New York, N. Y.

While others TALK thrift—you can show your employees "HOW to be thrifty."



Interior of transmitting room, in W G Y General Electric Co. radio broadcasting station, Schenectady, N. Y. This is the most powerful radio broadcasting station in the country. On one occasion messages were picked up in Cuba 1,450 miles away. Picture shows tube sets, control board and other apparatus. The programs are sent out from another building nearby.

Developments in Our Newest Industry

AS we go to press, comes the announcement that the World Series games, at the Polo Grounds, New York, are to be "broadcasted," play by play, to palpitating thousands of fans. To the radio enthusiast, who has kept in touch with developments, this news is less startling that it is to those who mistook the summertime lull for an evidence of collapse in the whole radio industry.

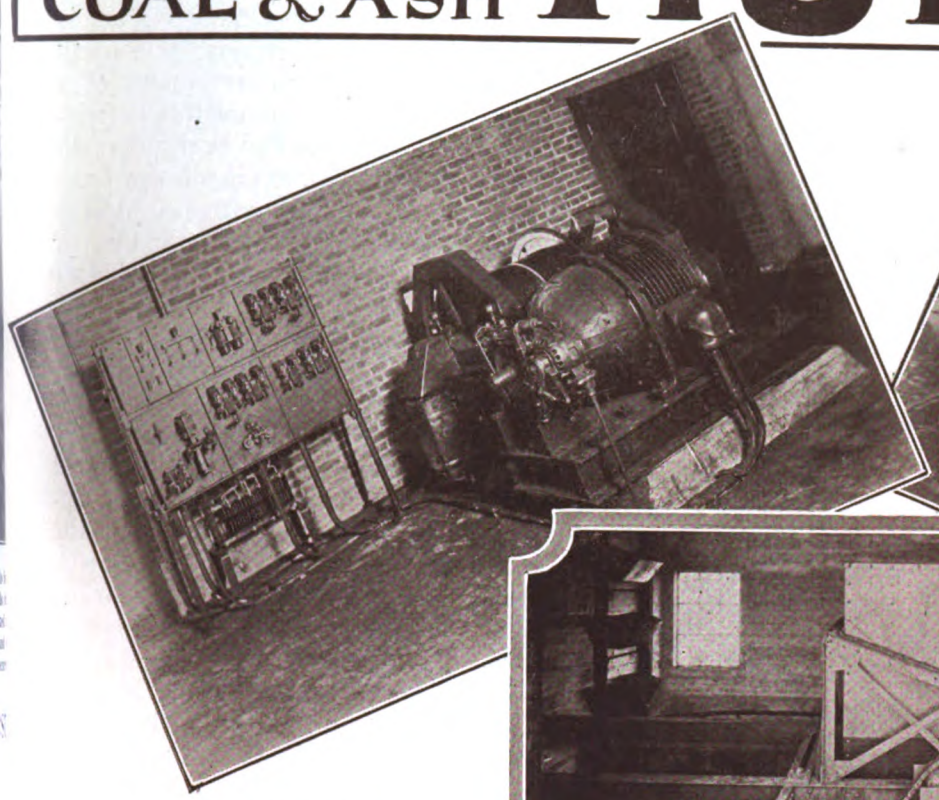
The chief unconquered enemy of radio is the existence of "static"—stray currents in the ether or in the earth's atmosphere, which create such a medley of sounds in the receiving apparatus as to drown out everything else. Just as summertime is the worst time for thunder showers, so it is the worst time for "static"—and therefore the least favorable time for radio broadcasting. When we review the strides made in the past few years, it is not unlikely that even "static" will be conquered before long; so that this newest art and science and industry may take the permanent place its importance warrants, without seasonal interruption.



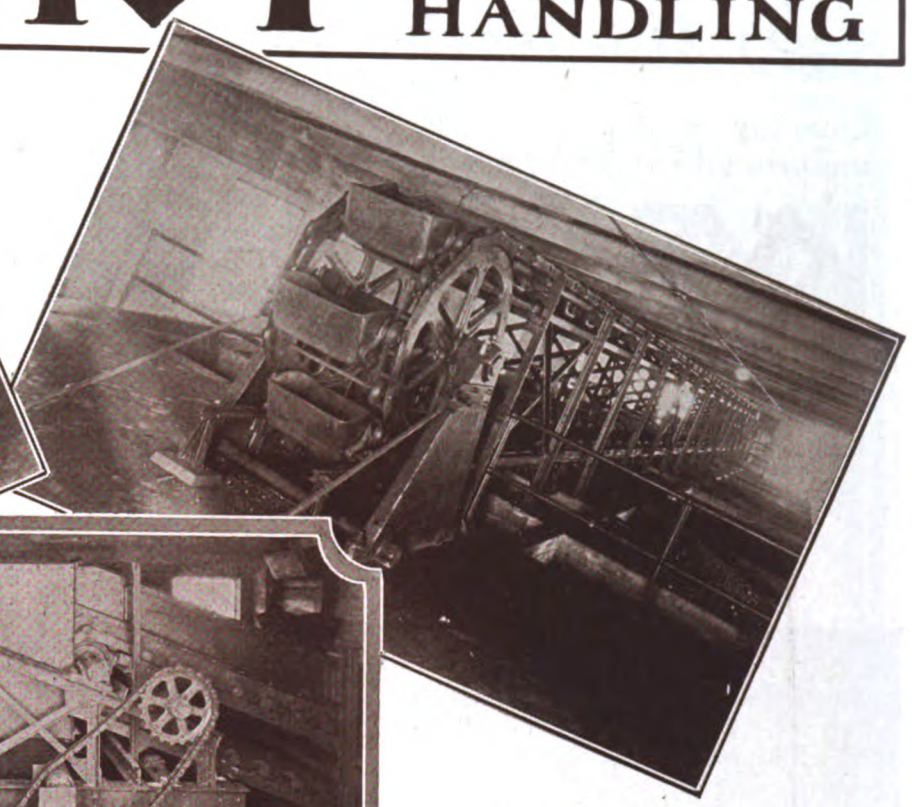
Assembling amateur wireless receiving sets for shipment in one of the factories of the General Electric Company. Operators are hard put to it to meet the tremendous demand which has grown up almost over night.

Digitized by Google

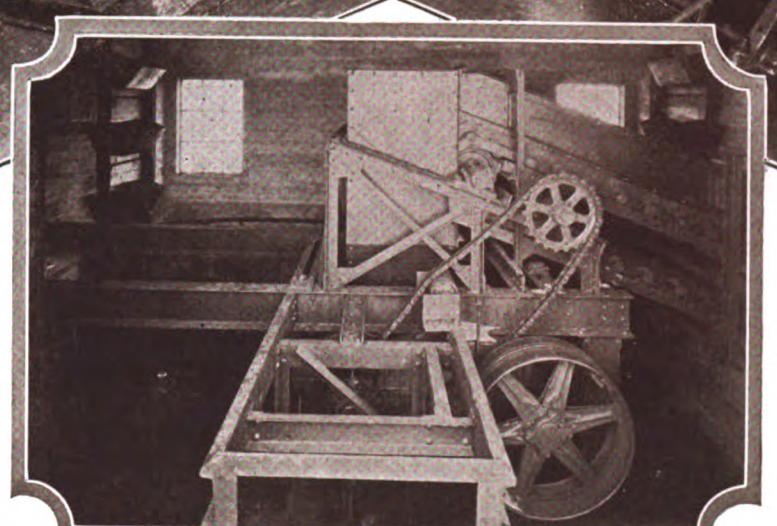
COAL & ASH HUNT HANDLING



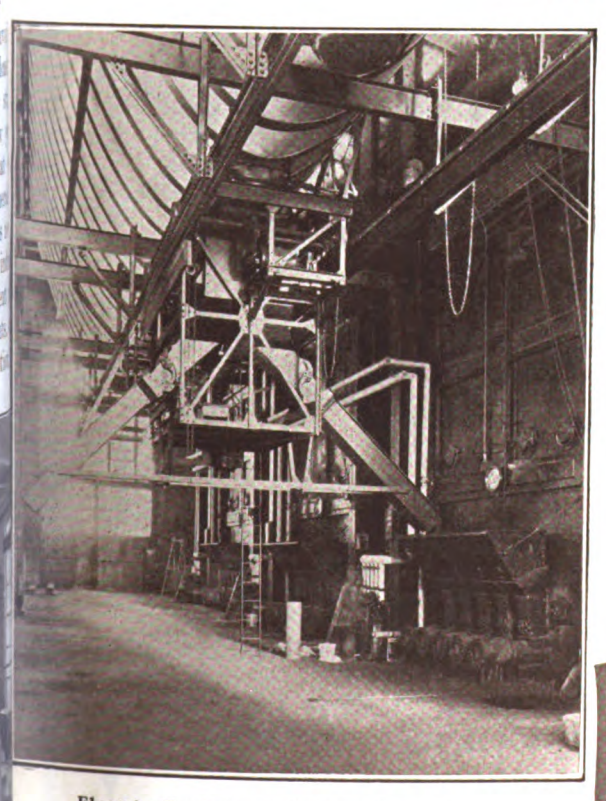
Control Panel and Hoisting Machinery for Skip Hoist



Double Run of Conveyor over Coal Bunker



Apron Conveyor Feeding Coal into Coal Cracker



Electrically Operated Traveling Weigh Larry

Cutting Down Power Costs

EVERY item of labor involved in getting coal from the cars to your grates, and in removing the ashes after combustion, is just that much added to your power costs.

The photographs grouped on this page show a complete coal and ash handling equipment which we recently installed at the Utica State Hospital.

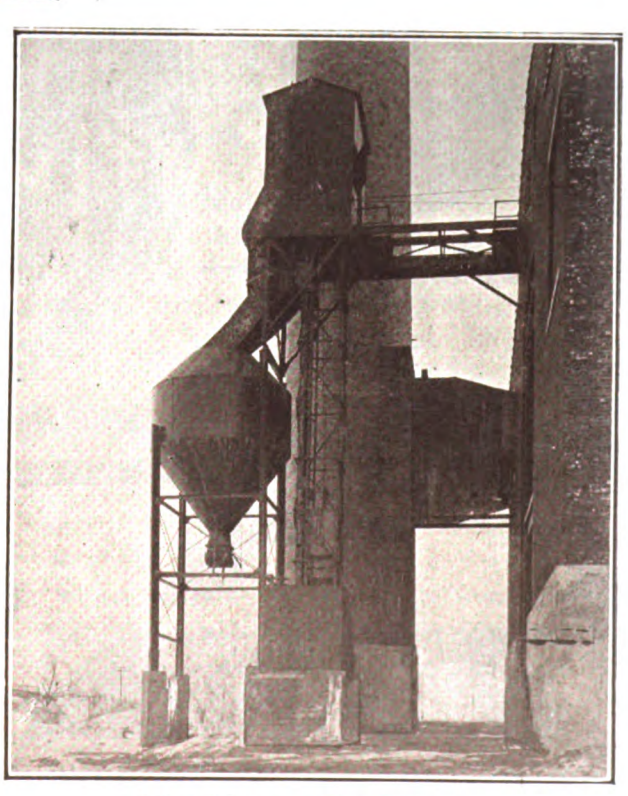
The installation shown effects a great saving in the handling of coal and ashes.

Our engineers are prepared to submit interesting figures on economies that can be effected in *your* power plant.

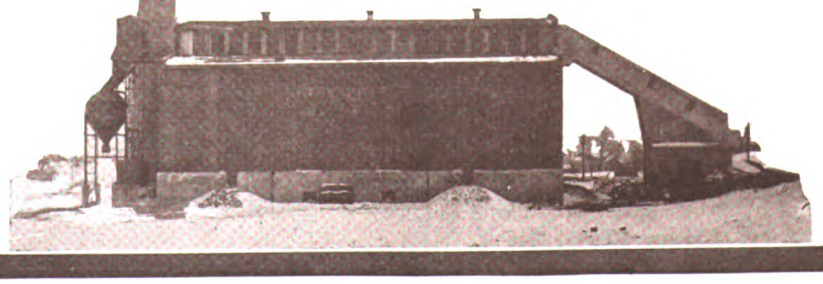
C. W. Hunt Co., Inc.

West New Brighton New York

New York Office, 143 Liberty Street
Phillips, Lang & Co., Inc. Ernest F. Learned
538 South Dearborn Street 141 Milk Street
Chicago, Ill. Boston 9, Mass.



Skip Hoist Handling Ashes to Storage Tank

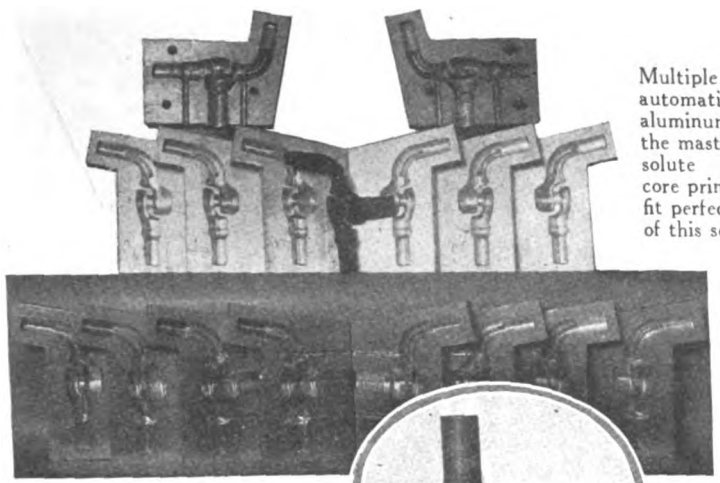


General View of Utica State Hospital Power plant

Digitized by Google

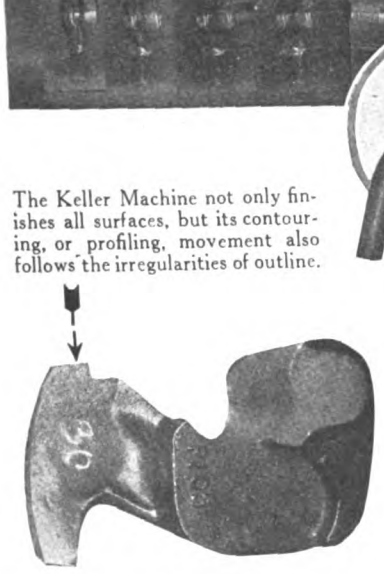
Do It Mechanically —by the Keller Method

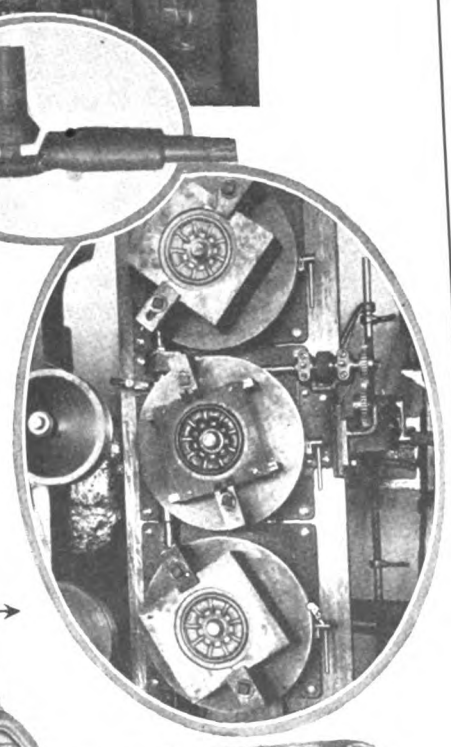
Quantity production *in the foundry* calls for uniform and accurate metal core boxes and patterns. To secure these quickly and at lower costs, keen visioned executives have turned to Keller Automatic Machines.



Multiple core boxes, automatically cut in aluminum or iron from the master, above. Absolute uniformity — a core print from one will fit perfectly in all others of this set.

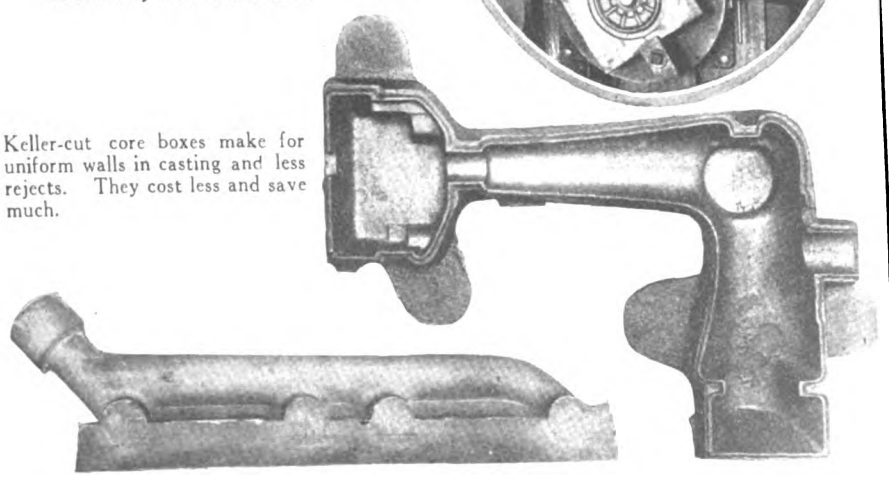
The Keller Machine not only finishes all surfaces, but its contouring, or profiling, movement also follows the irregularities of outline.





Cutting two metal patterns simultaneously from one master.

Keller-cut core boxes make for uniform walls in casting and less rejects. They cost less and save much.



Metal pattern for an exhaust manifold, a typical job. There is no limit to size, depth or intricacy—anything from valve fittings to bathtubs.

Keller Machines reproduce direct from plaster, wood or metal masters—the Keller method is applicable to every industry using Dies, Molds, Metal Core Boxes or Patterns.

Ask How It Applies to You

KELLER MECHANICAL ENGRAVING CO.,
58 Washington St., Brooklyn, N. Y.

What Suggestion Systems Have Accomplished

(*Continued from page 15*)

tion is needed at first to get the workers to understand that a mere complaint is not a suggestion, and to make them catch on to what is wanted; but when this is accomplished there will come real suggestions, many of them minor and intrinsically insignificant, but important and significant for the attitude of mind which they reveal. Only occasionally will a big idea come through the suggestion mill; but the savings wrought by this occasional big improvement plus the total of the little savings effected by numerous minor suggestions mean in the long run a big, tangible money value to the plant. The head of an important silk manufacturing company said recently that his concern saved more than $100,000 last year through improvements resulting from employee suggestions.

In the average factory where a suggestion system is working effectively, there will be offered in the course of a normal year suggestions affecting practically every department and feature of the business. There will be suggestions for the improvement of the product, for the better merchandising of the product, for improving personnel relations within the organization, for bettering working conditions, for increasing co-operation, for reducing spoilage and waste, for improving the equipment, and for improving the working methods. No statistics have been compiled on the subject, but, in the opinion of a number of suggestion department managers, the bulk of acceptable suggestions offered by factory workers affect (1) the product, (2) the equipment, (3) the working methods.

And of the three named above perhaps the greatest

(*Continued on Page 68*)

Just Suppose--

You had coming to you every month
A big bunch of
Pictured Progress
Such as you see in this copy of
Industry Illustrated

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name.....

Mailing Address.....

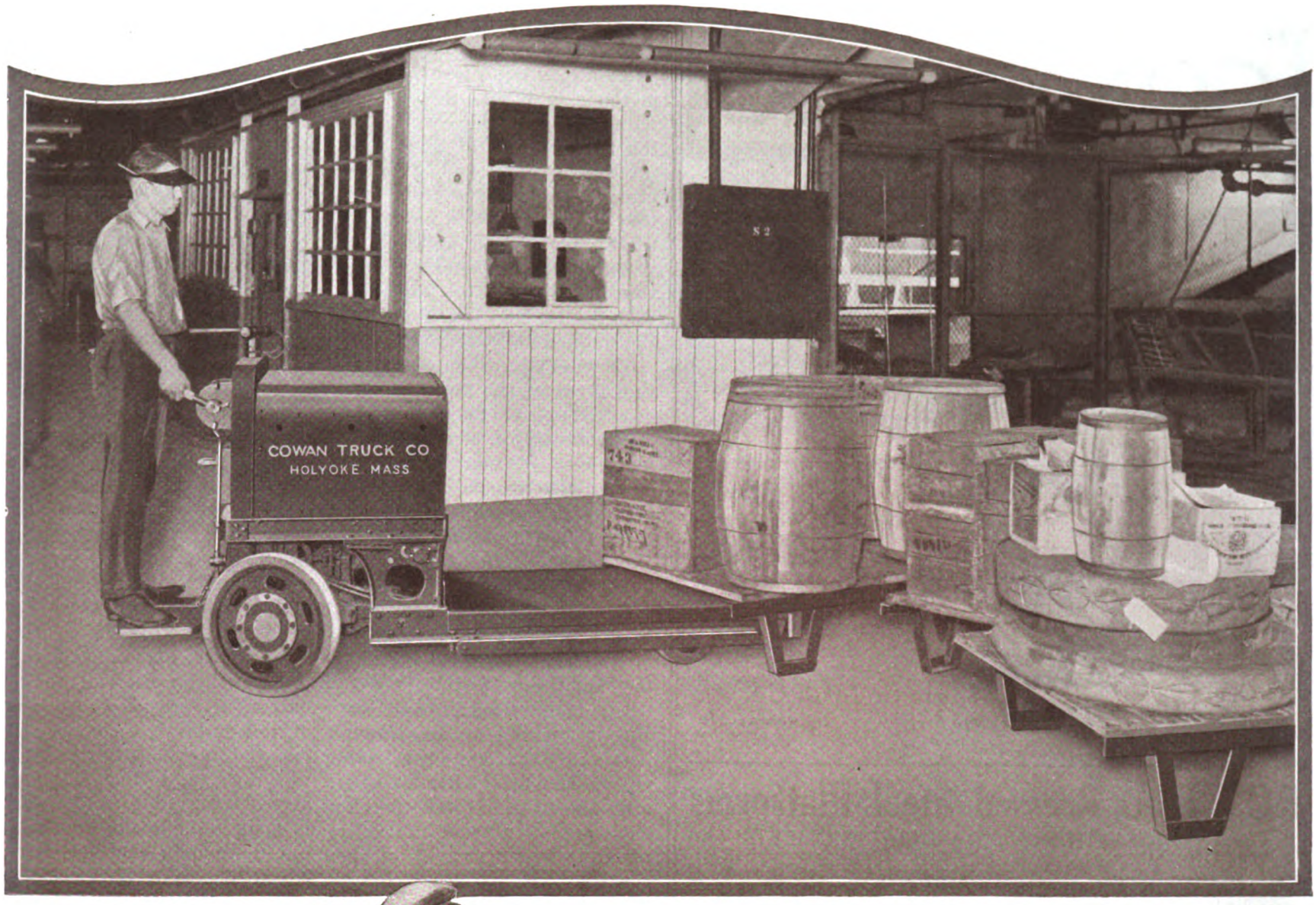
Company..... Position.....
(Important confidential information—for our own records only)

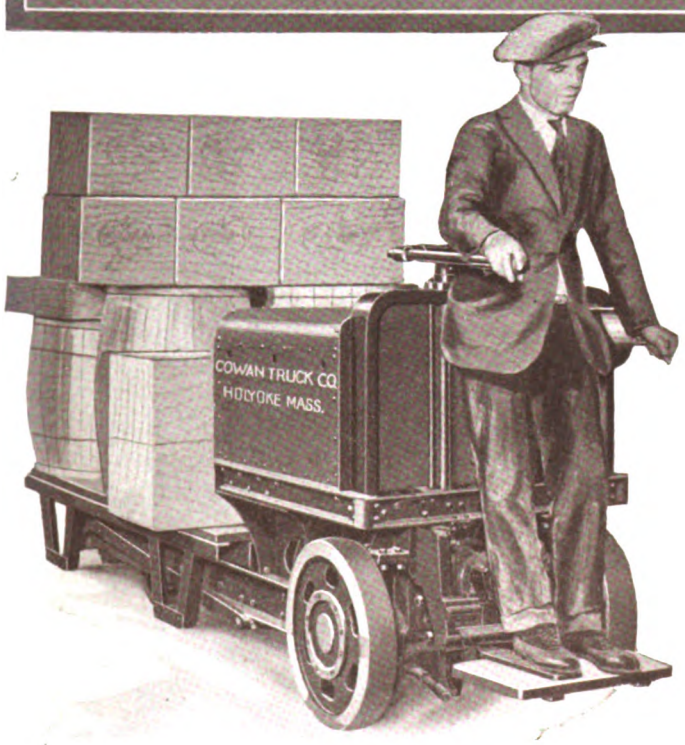
ANNUAL SUBSCRIPTION $1

In Canada, $1.25; Foreign, $1.50

10-22

Digitized by Google





Cowan Electric Truck Saves At Brown-Lipe-Chapin Co.

Mr. E. W. Zimmerman, Plant Engineer of this Company, at Syracuse, N. Y., advises:

"The actual saving effected by the truck is best figured roughly by estimating its saving of one man's time, which would probably amount to $1200 per year. In addition to this, we find a great saving which cannot be estimated in dollars and cents, in the quicker delivery of materials to the various departments, but this is a very noticeable feature with the truck."

Cowan Electric Lift Trucks, one-man operated, automatically pick up and deposit skidded loads weighing thousands of pounds. They eliminate rehandling with its great waste in time and labor and speed delivery of materials.

We have actual facts and figures on the worth while savings of Cowan Electrics. A Cowan representative will gladly lay them before you. Shall we mail you a copy of Bulletin No. 5?

Cowan Truck Company, 6 Water Street, Holyoke, Mass.

N. Y. Office: Grand Central Palace. Offices in Principal Cities.

2057-N

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

Digitized by Google

CONVEYING



ELECTRIC TRACTORS

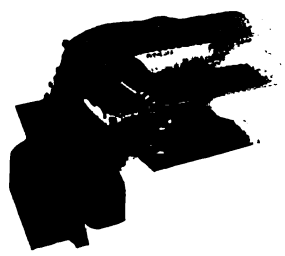
Transport Tons

where hand trucks move pounds. They reduce expense in all your departments.

Request Catalog 1208.

The Elwell-Parker Electric Company

Cleveland, Ohio



"High Duty" Magnetic Pulleys

For removing iron and steel from conveyed materials. Will positively protect your crusher, grinder or pulverizer against injury from "tramp iron."

Magnetic Mfg. Co.

267-275 23rd Ave, Milwaukee, Wis.

POWELL Pressed Steel Platforms

FOR USE WITH ALL HAND AND ELECTRIC LIFT TRUCKS



POWELL Platforms are cold-pressed from a single piece of steel and will stand up under a lifetime of hard usage! They combine lightness, ruggedness and extreme durability. Standard or special sizes furnished promptly. Get our literature and low prices.

The POWELL PRESSED STEEL CO.

HUBBARD, OHIO

SUBURB OF YOUNGSTOWN

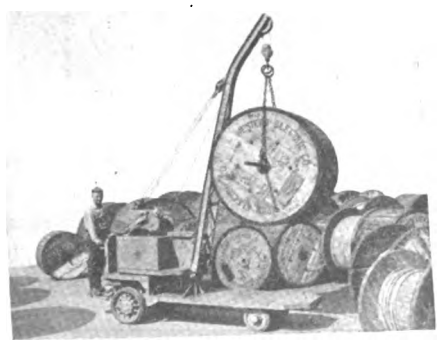
NORTHWEST CRAWLER

CRANES—with clam-shell bucket or grappling hooks.
DRAGLINES—For drainage jobs, excavating, grading.
SHOVELS—with only one motor—gas or electric.
A complete line proved in service. Patented crawler base provides

Unequalled mobility

Northwest Engineering Co.

Works: Green Bay, Wis.
General Sales Office: 28 E. Jackson Blvd., Chicago



Easiest Way to Handle 3,000 Pound Pieces

is on Electric Industrial Trucks equipped with REVOLVING CRANES.

Bulletin 51 tells how.

The Elwell-Parker Electric Company

Cleveland, Ohio

HANDLING

(Continued from Page 66)

number of suggestions received relate to equipment and to methods. What they work with and how they work are the two subjects of most intimate proximity and greatest importance to the average factory operatives; and naturally when they begin to think of possible improvements, they think of the tools or machines with which they work and of the methods of working.

Very often, when a suggestion involves the improvement of a tool or machine or perhaps the introduction of an entirely new piece of equipment, the change also affects the method of working. Such a suggestion is the following, taken from the experience of the Eastman Kodak Company.

Certain assembling operations in the shutter department of the camera works involve the handling of tiny screws with a magnetized screwdriver. But in picking up the screws it was rare that the screwdriver got them on the heads. Usually the worker had to take each screw off and carefully place it with the end of the screwdriver in the slotted head; then it was easy to insert the screw in its proper place in the shutter and drive it in. Pieceworkers in that department had been doing the job this way for many years, when one day the idea of using a positioner occurred to one of them. She suggested that a metal saucer be provided, in the bottom of which some countersunk holes had been drilled, and that the screws first be placed in this saucer. A gentle tapping of the saucer would cause the screws to drop into the holes, heads up, in position for picking up with the screwdriver in the slot. By the use of the positioner the hand operation was eliminated entirely. A motion study showed that the new method saved one and one-half seconds per screw handled, and if applied to all similar operations in the works it means a yearly saving of 4,670 hours.

Sometimes a suggestion means simply an improvement in the equipment. An example of this is furnished in the oil-burning furnaces used in the heat-treating department of the National Cash Register Company. When it became necessary to change from gas to oil as a fuel, a burner that was on the market was bought and installed. It did not give satisfaction, and as a result a new type of burner was conceived in the department and suggested to the management. Today practically all of the oil-burning furnaces, both the large furnaces in the heat-treating department and the smaller ones used in various departments, are equipped with the new burners, which are made in the plumbing department at a cost that is relatively trifling.

In this same factory it is necessary to go over the heating system from time to time, and the job of getting at radiators for repairing was a troublesome one. Four men were usually required to do the lifting, and besides there was preliminary work in clearing away space, and the interruption of other work while the repairing was in progress. One of the employees suggested a rig and tackle for lifting the radiators, and since this suggestion was adopted the work is easily done by one man without disturbing the machinery, workbenches, or workmen.

Another improved method installed in the factory of the National Cash Register Company as a result of a suggestion is the handling of a certain kind of register key. These keys are shot out of a polishing machine through a trough into a box. Under the old method they piled into the box helter skelter, frequently the box would overflow, and part of a man's time was required to straighten out the keys and rearrange them for efficient handling. In the new method, when a box is placed under the trough, a metal case which is divided into three narrow compartments, is placed in the box, which it fits like a loose lining. The effect of the narrow compartments is to cause the keys to straighten as they fall and lie parallel. When the three compartments are filled, the metal case, which has no bottom, is lifted out and the keys lie in symetrical order closely packed in the box.

Sometimes the improved method suggested will affect the wiring of electricity or the routing of material. An employee of a city electric company in the West submitted as his suggestion a wiring dia-

Digitized by Google

gram that eliminated a large number of lights and meant the saving of a considerable amount annually in both kilowatts and equipment.

In a paper mill there was chronic congestion in the shipping room due to the blocking of the entrances with stock. One of the men suggested the cutting of doors through the walls of those parts of the mill adjacent to the shipping room, and when this was done there was a remarkable improvement. Instead of stock moving circuitously, it now went by direct routes into the shipping room, the blockade was relieved, and as a result the production at one of the large paper machines increased 42 percent.

The suggestion of a foreman in another paper mill decreased the waste of paper rolls from the machines. Instead of using a hook as was the custom, he suggested using a knife, and the surplus paper, which heretofore had been regarded as so much jagged and crumpled waste, was trimmed into samples for the sales department's use. The old method had been to take samples from stock, and this feature of the suggestion saved the company several hundred dollars annually.

Where a suggestion system is functioning properly there will crop up in the course of the year a number of suggestions affecting the product. Once in a great while a suggestion that means an outstanding improvement in the article may turn up, but it must be admitted that such suggestions are rare. Such improvements usually come from the engineers or designers or from some technical experts who are continually studying ways to improve the product, simplify it, make it more efficient, more economical, more serviceable, and so on.

Perhaps the greatest number of suggestions affecting the product that come from employees are suggestions that mean a mechanical improvement in some detail. For example, the ribbon-reversing mechanism on a cash register includes a spring which is stretched between two arms. In earlier models the spring would occasionally work off, releasing the tension. To safeguard against this one of the employees suggested that the eyes at the ends of the spring be made oblong instead of round as theretofore. This little change in the shape of the eyes has entirely remedied the defect. The eye now can slip off the reversing arm only at one angle, and the tension of the spring prevents it from shifting around to that angle.

Another prize-winning suggestion in the National Cash Register Company resulted in making a certain part in two pieces instead of one. This part is the switch-lock lever. In the old-style one-piece lever, if repairs were necessary considerable taking apart was also required. In the new-style two-piece lever all that is necessary to remove the lever is to take out the two screws which hold together its two parts. The change seems small but it means an immense saving in time and labor.

In building the mechanism known technically as "telephone printer frames" it was usual to build them complete with ten teeth. One of the workmen discovered that the average system requires only four teeth, and suggested that the frames be finished hereafter with four teeth. The suggestion was adopted, frames built for stock are equipped with four teeth, and in those cases where more are needed it is easy to add teeth when installing the system. The result of this suggestion is not an improvement in the product, but a saving in labor and material and a decrease in the cost of production.

The suggestion system works with office workers quite as successfully as with factory workers. (It is generally thought best to have separate systems for these widely contrasting departments, though one office may handle both systems.) Economies in the office, as the management engineers have shown, are just as valuable and quite as important as economies in the shop. When the office employees are stimulated to offer suggestions, their ideas are generally concerned, in the main, with office methods, equipment, and clerical routine.

For example, a stenographer in the office of a Wisconsin factory sent in this suggestion which was favorably acted on by the management and re-

CONVEYING



Chain Hoists for All Purposes



¼ to 30 Tons Capacity

Safe Dependable Economical

WRIGHT

Lisbon, Ohio

Our catalog will interest you

EASTON INDUSTRIAL CARS



FOR COAL HANDLING

—

CARS, TRACK TURNTABLES EQUIPMENT SWITCHES

EASTON CAR AND CONSTRUCTION CO.

Main Office & Works: Easton, Pa. Branches in Principal Cities 2172-E

Do Pictures of Conveying Apparatus Interest You?

Write for Bulletin No. 54. Conveying, elevating and hoisting machinery

ROBINS CONVEYING BELT COMPANY

NEW YORK, 14 PARK ROW — BOSTON, 70 KILBY ST.
CHICAGO, OLD COLONY BLDG. — PITTSBURGH, UNION ARCADE BLDG.
El Paso, Texas . . . 349 First National Bank Bldg.
Birmingham, Ala. . . . C. B. Davis Engineering Co.
Toronto, Ontario . . . Gutta Percha and Rubber, Ltd.
San Francisco . . . . . The Griffin Company



THROW AWAY YOUR WHEELBARROW and get a

BRADY

STEAM JET ASH CONVEYOR

Save hundreds of dollars. BRADY STEAM JET ASH CONVEYORS are saving money in hundreds of plants. Tell us your problem: send for our "Book of Facts."

We will show you just what we can save you.

THE JAMES A. BRADY FOUNDRY COMPANY

4510 Western Blvd. Chicago, Ill.

Also manufacturers and designers of Pneumatic Conveyors for handling granular and pulverized materials of all kinds.

Save Handling Expense!

Barrett Handling Equipment

BARRETT

Steeleg Lift Truck Platforms, Portable Elevators, Portable Cranes, Powerox Gas Tractor, Barrel Trucks.

Write for full descriptive literature.

Barrett-Cravens Company

1334W. Monroe St. Chicago, Ill

HANDLING

Digitized by Google

sulted in a daily saving of time and postage:

"I suggest the use of trays, each labeled with the name and address of one of our distributors. All letters addressed to these distributors could be placed in the trays as typed during the day and at night *all* to each firm mailed in *one* envelope. This would save probably $5 daily in duplicate postage, as well as stenographer's time in addressing separate envelopes for each letter as is done now. The writer often has five to ten letters in one day for our Illinois distributor, for example."

In another factory office an employee suggested that a strict rule for filing material be adopted, which would rule out all matter that did not clearly promise to be of permanent value. As a result of his suggestion the files have been overhauled and relieved of nearly a ton of dead matter, and a system is now operative which will safeguard against such waste of filing effort and filing space in the future.

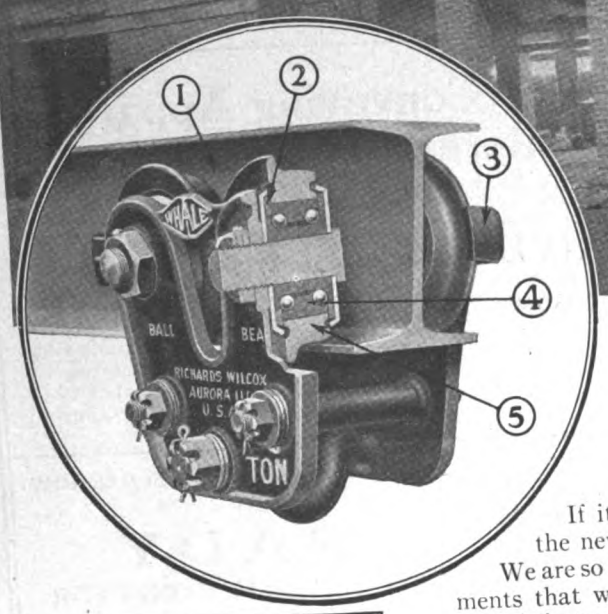
All of the results of suggestion systems mentioned in the foregoing are tangible. They mean improvements that you can touch or see. To a considerable extent in most cases they can be measured on a dollars and cents basis. But in addition to these material results are intangible results that are rightly regarded by many business executives as of important value in themselves.

"We believe the value of the suggestion system to be almost limitless," said the manager of a highly successful suggestion department. "Our plan has proved very profitable. It has resulted in giving us an improved product, better factory and office systems, new selling and advertising methods, better health and safety features, has saved thousands of dollars in the cost of production, and in fact every phase of the company's business has been benefited by the suggestion plan. Another benefit that should not be lost sight of is the benefit the suggestor receives besides the monetary prize, and that is the increased knowledge of the business he gains by working out his ideas."

From an executive in another company, one in the far West, came this comment: "The company is pleased with the results of its suggestion campaign, and finds nothing in the campaign that it would change. The plan has proved to be an excellent stimulant to department heads and to employees. It has been particularly valuable in eliminating the excuse of the rank and file to sit around on a bench, tell each other what they would do if they were boss, and let it go at that. With the suggestion system in operation, the men have a fine opportunity to tell seven different officials (the suggestion committee) what they think ought to be done, with the possibility of getting paid for doing it."

The intangible benefits are mainly three: (1) the cultivation of powers of observation, analysis, and judgment in the mind of the worker and of a sense of working with the management for better production, (2) the reflex influence on his daily work of a worker's thinking constructively in terms of improvement, and (3) the effect on a worker's self-respect and attitude toward his employer. These intangibles do not lend themselves to any form of measurement, but they may directly affect production, economies, and profits.





Five Exclusive Features

1 Because of its short wheel base, the "Whale" operates almost as easily on curves as on a straightaway. Tests have proved that a boy can operate the one-ton "Whale" even when it is loaded to capacity.

2 Felt washers prevent gritty dust and dirt from reaching the bearings. They also provide perfect lubrication, as the felt absorbs oil from the oil hole and transmits it to the bearings continuously.

3 Another exclusive feature. Bumpers protect all four wheels from shock when trolleys bump together or strike stop at end of track. It is practically impossible for the wheels of the "Whale" to become chipped.

4 Combination and radial thrust bearings are found only in the "Whale." The ball races are ground and the balls themselves are of high duty steel. This feature enables a one-ton load to be started by the pull of a man's little finger.

5 Reduced friction is assured by crowning the wheel treads. Also the treads are chilled to give maximum hardness and minimum wear. This is another reason why the "Whale" will withstand long years of hard service.

Try the Whale at Our Expense

If it were humanly possible to build a better trolley than the new and improved "Whale," *Richards-Wilcox* would do it. We are so confident of its ability to meet your most exacting requirements that we are willing to send it to you for free trial. If in any way it fails to come up to your expectations, simply return it at our expense. No offer could be fairer than this.

A "Whale" of a Trolley

The new "Whale" is precisely what the name implies—*a whale of a trolley.* It is the crowning achievement of many years of trolley-building experience—the result of a sincere desire to overcome *every* fault common to I-beam trolleys. Rigid tests have demonstrated that the new "Whale" is by far the most easily operated, most efficient and most durable trolley ever produced.

Let R-W Equipment Help You, Too

Hundreds of manufacturers have proved the economy of R-W. conveying equipment. As an example, Mr. J. D Clark, Works Engineer of the Moline Plow Company, writes—"In our foundry one man, with *Richards-Wilcox* equipment, can easily move a large bull ladle which would ordinarily require four men to handle. Every piece of *Richards-Wilcox* equipment has paid for itself many times."

Remember, we stand ready to send you a "Whale" trolley for free trial whenever you say the word. It is made in seven capacities—½ ton to 4 tons.

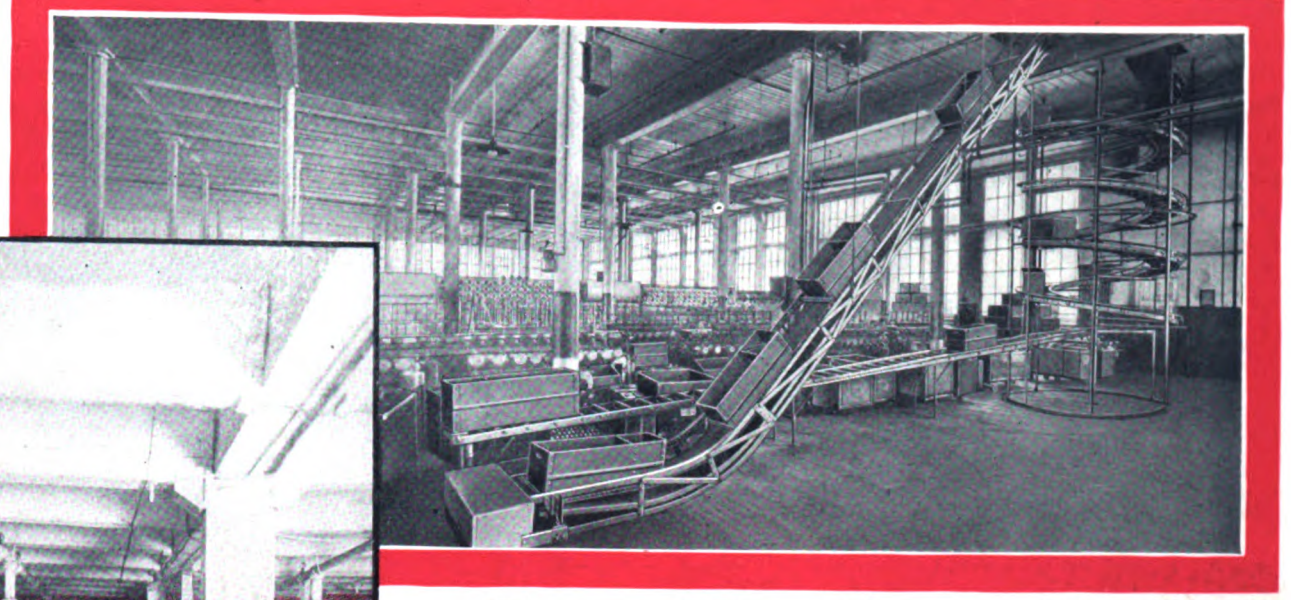
Richards-Wilcox Mfg. Co.
"A Hanger for any Door that Slides."
AURORA, ILLINOIS, U.S.A.
Minneapolis Philadelphia Chicago Boston New York St. Louis Cleveland Indianapolis Los Angeles San Francisco
RICHARDS-WILCOX CANADIAN CO. Ltd
Winnipeg LONDON, ONT. Montreal

Catalogue DD23 fully describes this equipment. Send for your copy.



Quality leaves it's imprint

Digitized by Google





From Textiles to Radio

IN the oldest and newest—throughout all industry, conveyors are working surprising economies.

In many of the older industries, conveyors have thrown out methods in use for generations, replacing them with new. In old plants they have made possible new groupings of machines and new processes of manufacture, resulting in economies hitherto out of the question.

New industries, unhampered by tradition, are making conveyors as essential a part of their production systems as any other machinery in their plants.

Whether your business is an old one in an old plant or a young one in a brand-new factory, conveyors are equally vital for securing the low costs necessary to win your share of business in competitive markets.

Let us show you specifically what a Lamson Conveying System will do in your plant toward reducing your expenses and increasing your production. A written request will bring you more information.

THE LAMSON COMPANY
SYRACUSE, NEW YORK
Branches Everywhere

Lamson Conveying Systems

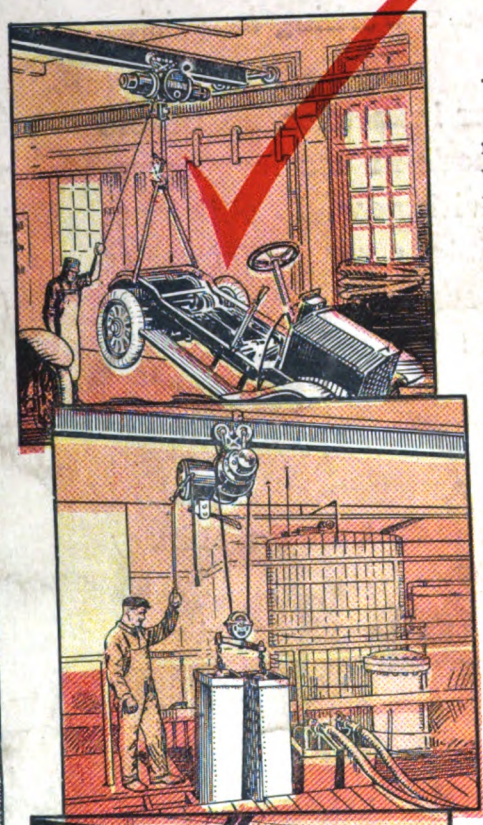
LAMSON SERVICE

Digitized by Google

THE SHEPARD ELECTRIC LIFTABOUT

A new and smaller Electric Hoist

Check your own need for this economy hoist



WITHIN a comparatively short time a thousand and more business men have discovered the very material handling economies which they long sought and which they obtained through using the small, but powerful *Shepard Electric LiftAbout*.

These men have stopped the waste of time and money that goes with manual load handling. They have substituted this new hoist of remarkable efficiency and economy for improvised methods that for years had been "eating" into the profits.

EQUAL ECONOMIES

The money the *LiftAbout* can save and is saving in practically every business is worthy of the investigation of any man whose business requires the moving of loads—the *lifting, carrying, putting down* of articles.

AMAZINGLY LOW PRICE

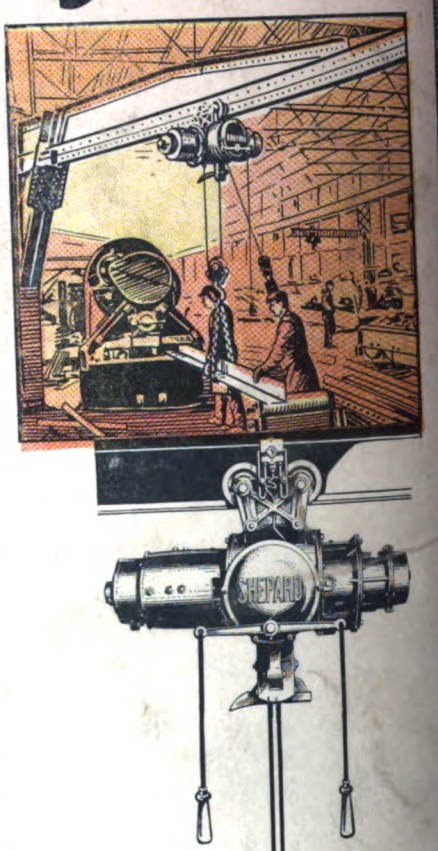
We are making *LiftAbouts* on a quantity production basis and selling them as fast as they are made, which, with standardized manufacture makes their price amazingly low. Twenty years' specialization in electric hoist manufacture is behind them; they have same features that have made "Shepards" the most widely used hoists in America.

EASILY INSTALLED

Quickly erected to operate on overhead track. Negligible in upkeep. Built in ½ and 1 ton capacities for the hardest service you may impose upon it.

We'll gladly tell you of people in your line who are making remarkable savings even greater than ever anticipated AND HOW YOU CAN DO THE SAME. WRITE US.

We also build electric hoists and cranes in capacities to 30 tons.

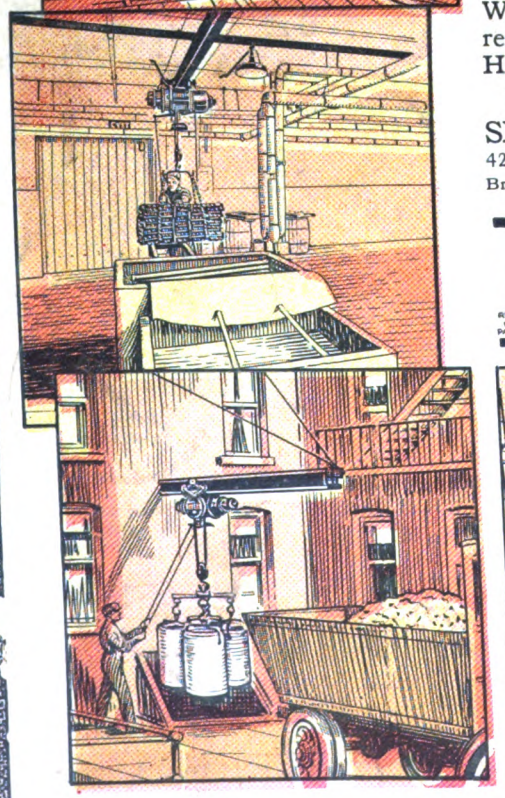


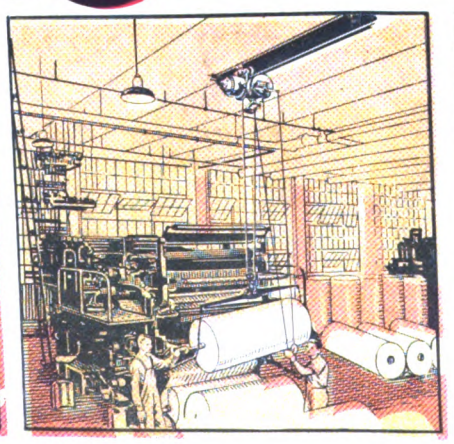
SEND FOR this phamplet. It most likely illustrates an application similar to yours, if your kind of load-moving is not shown here.

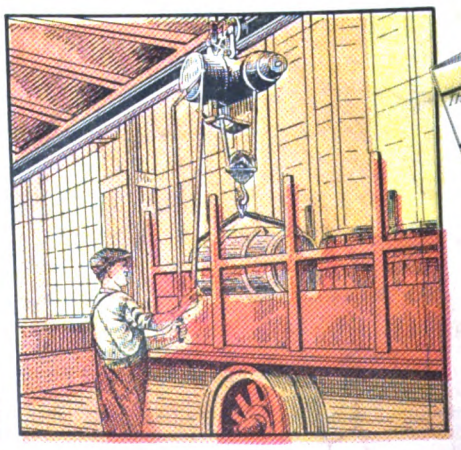
SHEPARD ELECTRIC CRANE & HOIST CO.
420 SCHUYLER AVE., MONTOUR FALLS, N. Y.
Branches in principal cities (Member Electric Hoist Manufacturers' Assn.)

REG. U.S. PAT. OFF.

SHEPARD
ELECTRIC CRANES & HOISTS









NOVEMBER 1922

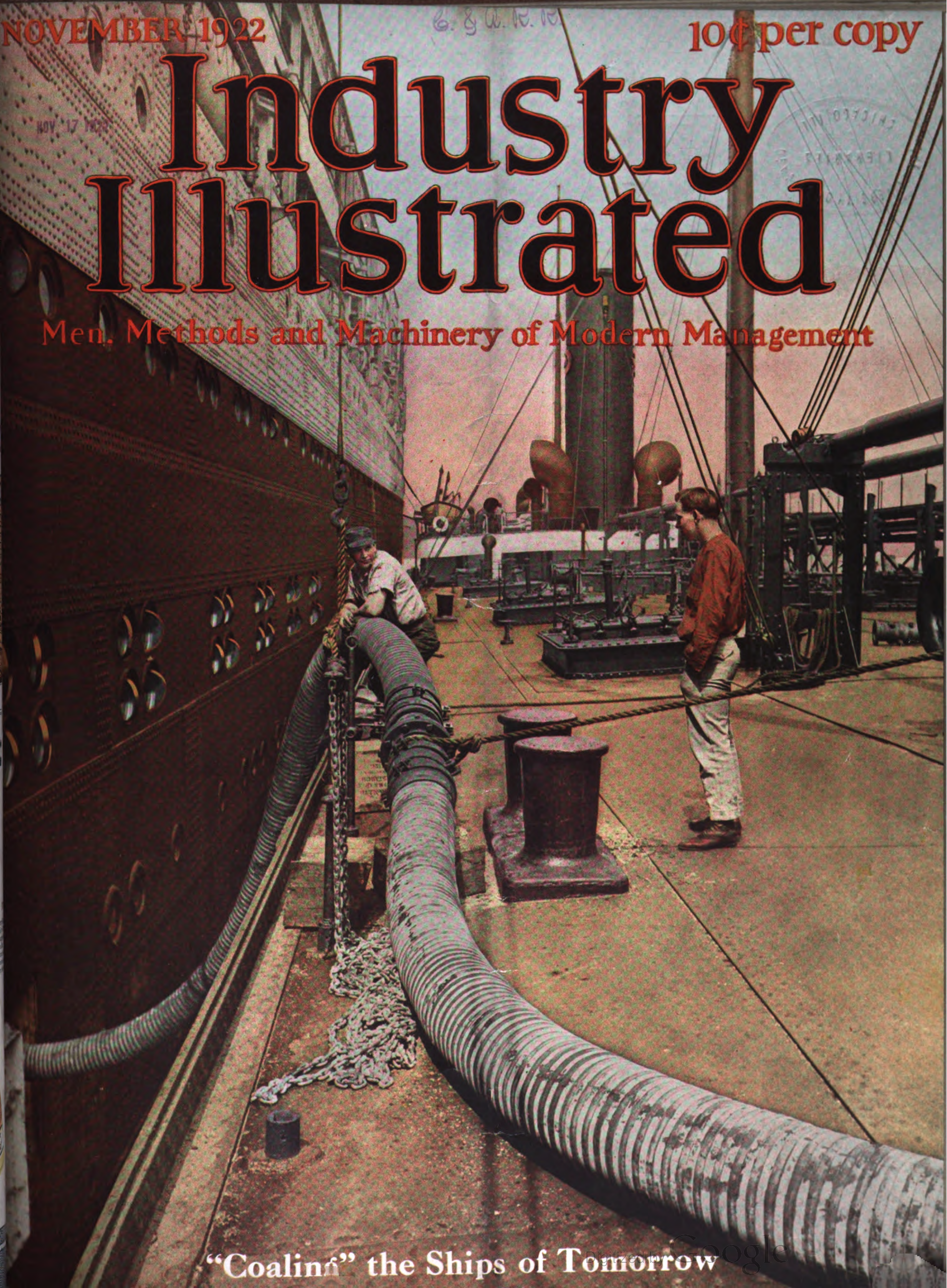
10¢ per copy

G. & A. R. R.

NOV 17 1922

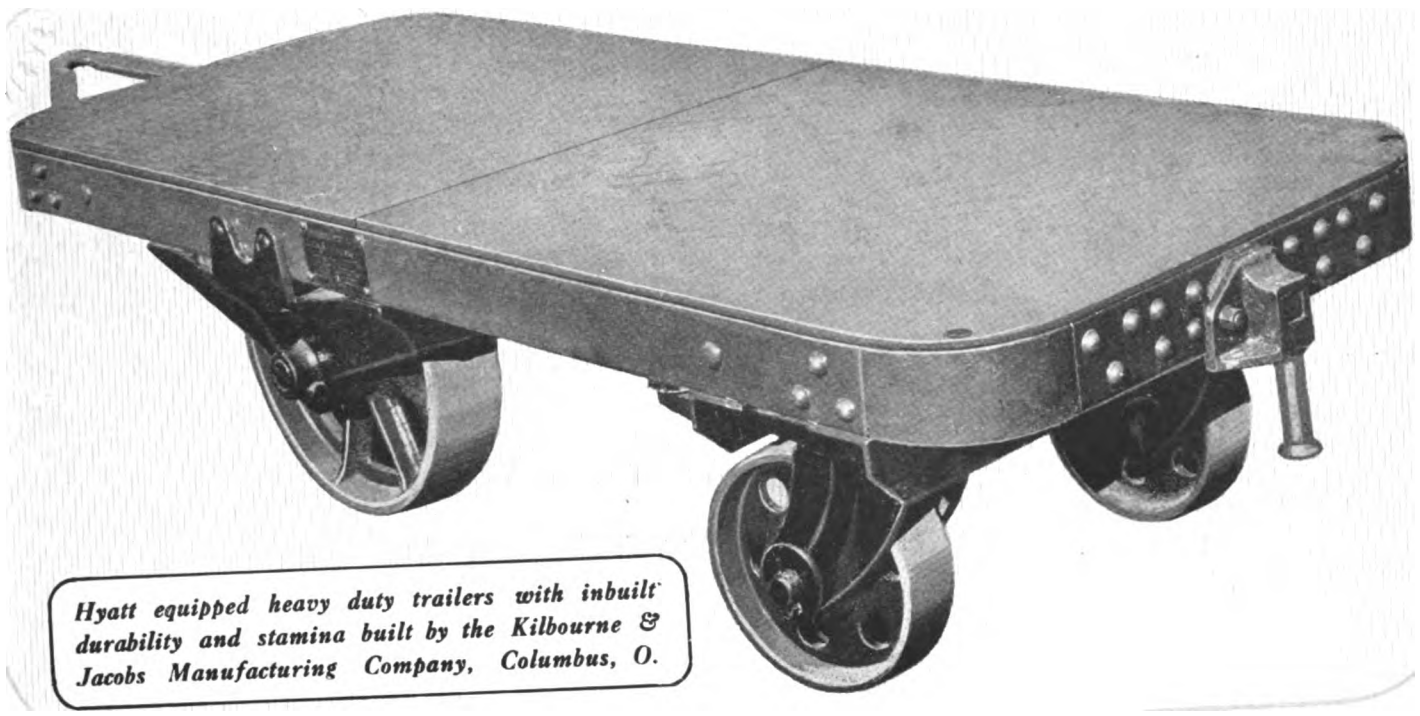
Industry Illustrated

Men, Methods and Machinery of Modern Management



"Coaling" the Ships of Tomorrow

Digitized by Google



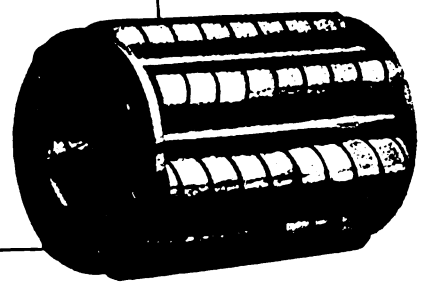
Hyatt equipped heavy duty trailers with inbuilt durability and stamina built by the Kilbourne & Jacobs Manufacturing Company, Columbus, O.

Building Durability Into Trailers

For handling large tonnages quickly and economically the tractor and trailer method is both ideal and practical. To obtain maximum service from trailers however at lowest cost—durability, the quality to successfully stand up in continuous operation, must be designed and built into the trailers.

The heavy duty trailers manufactured by Kilbourne & Jacobs are excellent examples of durably built trucks. Their strong platforms, wheels and axles are matched with sturdy Hyatt roller bearings and the combination gives a trailer that will dependably carry its loads continuously for years without bearing adjustment or replacement.

For a truly economical trucking system—specify that your trailers be Hyatt equipped.



Hyatt Roller Bearing Co., New York, N. Y.

Industrial Bearings Div., New York
Motor Bearings Div., Detroit
Tractor Bearings Div., Chicago
Pacific Coast Div., San Francisco

Digitized by Google



INDUSTRY ILLUSTRATED

CONTENTS

November, 1922

Editorial—The Overwhelming Minorities Page 7

The Direct Route From Fuel to Power 8
By W. Thomson Lees—How the Oil Engine Fits into the Present day Power Situation.

The Early History of Iron and Steel 12
By H. H. Manchester.

Safeguarding Quality in Motor Car Production 14
By John H. Van Deventer—"Super Supervision" and Flying Squadron Inspection at the Packard Plant.

From Inventor-Manufacturer to Scientist 17
By Ernest H. Rowe—Biographical Sketch of Charles F. Brush.

Evolution in Belting Practice 18
By Viggo Sahmel—Some accomplishments of the short-center belt drive.

Cutting Costs on the "Road from Here to There" 20
By H. L. Fisher—How the Hand Lift Truck Boosts Profits.

Lilliputian Mines and Factories 22
By C. F. Talman—Fascinating Models in the U. S. National Museum.

The "Sport" of Saving Human Lives 23
By R. T. Barrett—First Aid Work of the Bell Telephone Co.

The Overhead Trolley in Lumber Production 24

How Machinery Gets $15,000,000 a Year from Clam Shells 26

For photographs in this issue not otherwise credited, we are indebted to Barret-Cravens Co., Lewis-Shepard Co., Cowan Truck Co., F. L. Smidth & Co.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.,

Founded 1891 by

JOHN R. DUNLAP
Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — WALTER IVES, *Vice-President* — RUTLEDGE BERMINGHAM, *Vice-President* — JOHN R. DUNLAP, JR., *Secretary-Treasurer*

Vol. 3, No. 5. Subscription price $1.00 per year; single copies 10 cents.

Copyright, 1922, by The Engineering Magazine Co., in both the United States and Great Britain.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google



How Heinz Handles Coal

Storage space is valuable and limited in the part of Pittsburgh in which is the H. J. Heinz Co. plant. Their reserve coal has to be piled high. To help solve the resulting problems of unloading and reclaiming, two Barber-Greene Portable Conveyors were put to work in 1918.

They proved themselves so mobile, so trouble-free in operation, and so economical that another was purchased in 1919 and five more in 1922. Today three of the H. J. Heinz Company's eight Barber-Greene Portable Conveyors are at work in a plant at Bowling Green, Ohio, and two in a Canadian plant—not because the storage problems there are similar to those in Pittsburgh, but because the Barber-Greene units have proved their superior utility and economy for coal handling in general.

The General Carbonic Company, Long Island City, N. Y., has found that one Barber-Greene Conveyor saves $1672 a year and eliminates the "floating gang" problem. The Portland Gas Co., Portland, Maine, uses the Barber-Greene as fire-fighting equipment and to supplement permanent conveyors.

SEND THIS COUPON

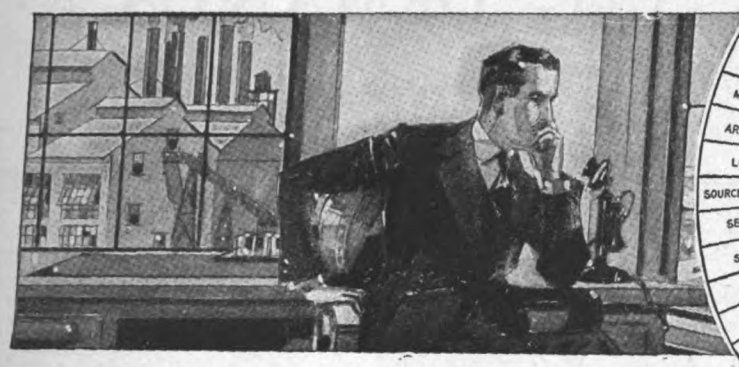
Barber-Greene Company
470 W. Park Avenue, Aurora, Ill.
Please send me Cost Report "E" and your "E" Catalog. (No obligation).
Name .....
Company .....
Address .....

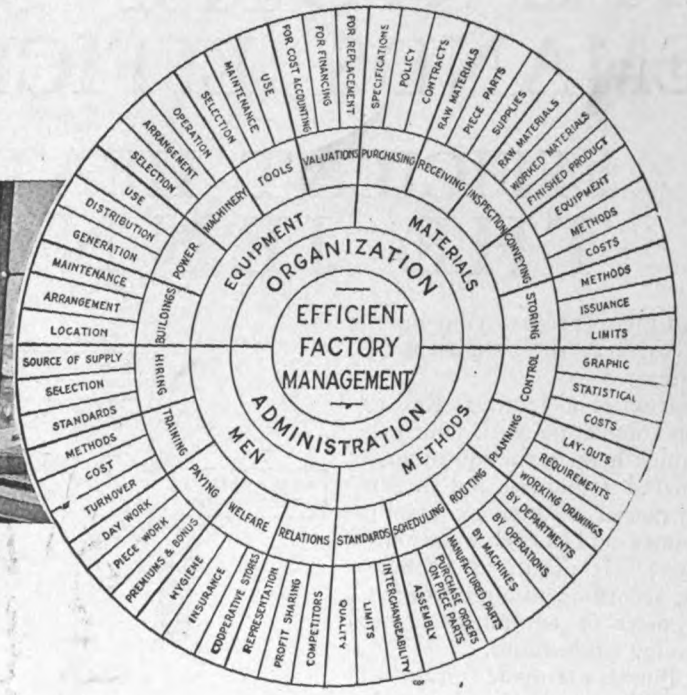
Barber-Greene Company

470 W. Park Avenue, Aurora, Ill.

Branch Service or Sales Offices in 33 Cities

Digitized by Google




EFFICIENT FACTORY MANAGEMENT
ORGANIZATION
ADMINISTRATION
EQUIPMENT
MATERIALS
MEN
METHODS
BUILDINGS
MACHINERY
TOOLS
VALUATION
PURCHASING
RECEIVING
INSPECTION
CONVEYING
STORING
HIRING
TRAINING
PAYING
WELFARE
RELATIONS
STANDARDS
SCHEDULING
ROUTING
PLANNING
CONTROL
POWER
LOCATION
ARRANGEMENT
MAINTENANCE
GENERATION
DISTRIBUTION
USE
SELECTION
SOURCE OF SUPPLY
STANDARDS
METHODS
COST
TURNOVER
DAY WORK
PIECE WORK
PREMIUMS & BONUS
HYGIENE
INSURANCE
COOPERATIVE STORES
REPRESENTATION
PROFIT SHARING
COMPETITORS
QUALITY
LIMITS
INTERCHANGEABILITY
ASSEMBLY
PURCHASE ORDERS ON PIECE PARTS
MANUFACTURED PARTS
BY MACHINES
BY OPERATIONS
BY DEPARTMENTS
WORKING DRAWINGS
REQUIREMENTS
LAY-OUTS
COSTS
STATISTICAL
GRAPHIC
LIMITS
ISSUANCE
METHODS
COSTS
METHODS
EQUIPMENT
FINISHED PRODUCT
WORKED MATERIALS
RAW MATERIALS
SUPPLIES
PIECE PARTS
RAW MATERIALS
CONTRACTS
POLICY
SPECIFICATIONS
FOR REPLACEMENT
FOR FINANCING
FOR COST ACCOUNTING
USE
MAINTENANCE
SELECTION
OPERATION
ARRANGEMENT
SELECTION
USE
DISTRIBUTION
GENERATION
MAINTENANCE
ARRANGEMENT
LOCATION
SOURCE OF SUPPLY
SELECTION

THE COAL SITUATION DEMANDS EFFICIENT HEATING

EFFICIENT HEATING DEMANDS THE JENNINGS PUMP

Now is the time to prepare your heating facilities to meet the conditions of the coming winter.

The installation of a Jennings Return Line Pump in connection with your system means quick heat in the morning, at the most isolated radiators, and in zero weather. It means a positive control of heat at all times and the elimination of radiator noises. It means an economy in fuel, that, according to our customers, makes this piece of equipment a real dividend paying proposition.

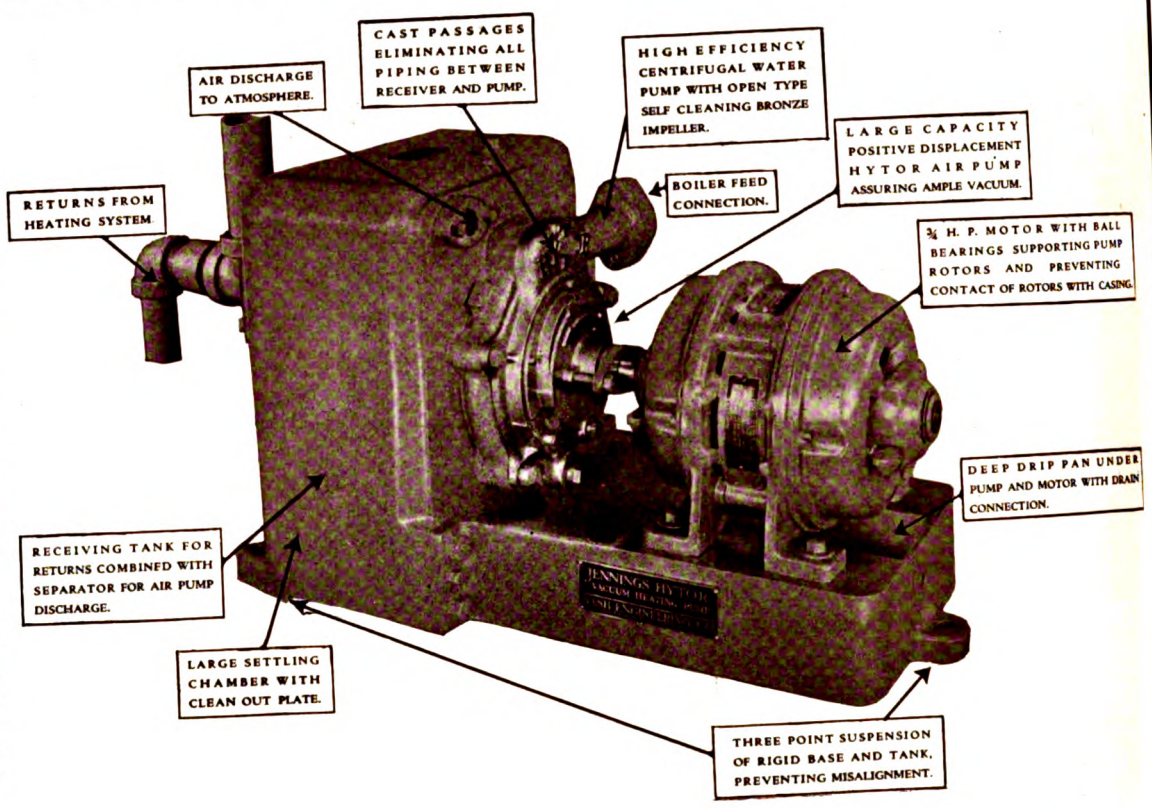
Jennings Pumps are made for any size installation. The small unit here illustrated has ample capacity of 5,000 sq. ft. of equivalent direct radiation. Because of simplified design, in connection with quantity production, this outfit is being sold at a price never before possible in a pump of this capacity.

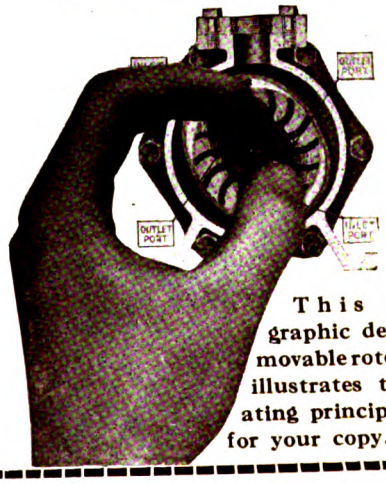
The pump incorporates all of the high grade workmanship and material characteristic of our Jennings equipment. It is equipped with solid bronze air rotor, rotor housing, water impeller and shaft.

In this unit all piping complications have been removed, and it is only necessary to make three connections:

1. The return main.
2. The water discharge.
3. The air discharge.

Write for Bulletin and Prices

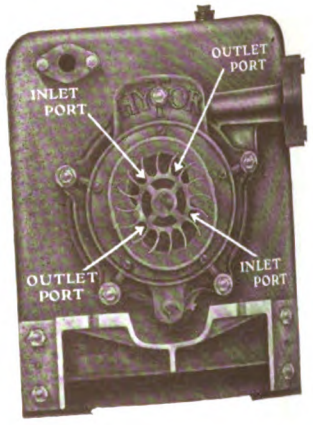


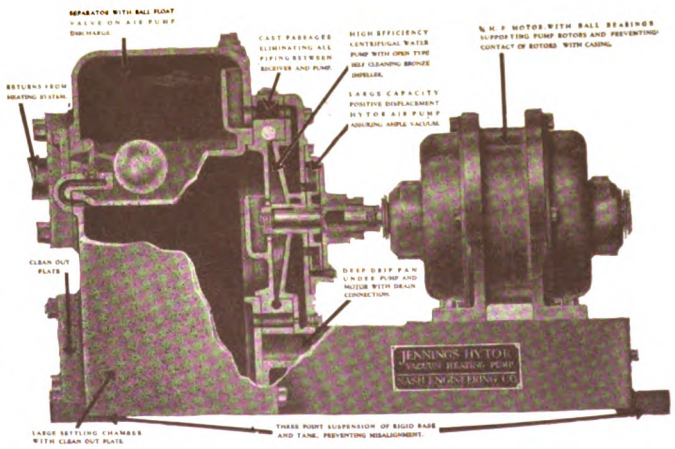


This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

The air capacity is 3 cubic feet per minute, measured at 10" of mercury vacuum. The pump at the same time handles 8 gallons of water per minute from a vacuum of 10" of mercury against 10 lbs. gauge pressure at the pump. Under these conditions the pump requires ¾ h.p. motor.

In this pump a positive displacement vacuum pump with high efficiency exhausts air only, while the centrifugal pump element handles only the condensate. In thus separately handling air and water in a predetermined ratio, such high efficiency is effected that no other pump can be secured of equal capacity for similar service with the same minimum horse power requirements.





While the new compact "M" type is furnished in one size, our well known Jennings Pumps in separate tank design, as recommended for larger capacities, are furnished for any size installation.

Many thousands of these pumps have been installed and have given universal satisfaction.

An important feature of these pumps is the very large air volume, as compared with their capacity rating, which assures ample vacuum.

As the horse power required is considerable less than for any other pump in the market of the same *rating*, regardless of the actual *volume*, the result is very low electric current cost. This, coupled with the extreme durability of these units, makes them the most economical return line heating pump it is possible to install.

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps
- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps

NAME .....

POSITION .....

COMPANY .....

ADDRESS .....

NASH ENGINEERING CO.
SO. NORWALK, CONN. U. S. A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

The Overwhelming Minorities

IT is an accepted fact that the majority rules—in politics, in society, in industry. But the majority is itself, ruled by tradition, by the fetish of doing things "as they have always been done." In every sphere of human endeavor, at every stage of human development, there is and has always been a minority; a minority ruled, not by tradition, but by the obsession that things can and should be done *better* than they have always been done.

Almost seven hundred years ago, the then King of England issued the first coal mining charter, granting the freemen of Newcastle permission to dig "stone coal" in the castle fields. To the great majority of people of that time, this coal was not only useless—since they had always used wood and charcoal—but its dense smoke soon appealed to them as a positive nuisance; so, at the instance of the majority, the mining or burning of coal was made a punishable offense. But a relatively small minority of men, blind to everything but the enormous advantage of the new fuel over the old, continued to dig and to utilize coal; so that, by the time Edward II had ascended the throne, coal mining and coal burning were again legalized and became widespread.

For some four hundred years, coal was being mined and burned; simultaneously, iron was being smelted in the good old way with charcoal as fuel; and the great majority of humankind was more or less content. But another disturbing minority, in the person of an iron smelter, was not content; he ignored the fact that iron had always been smelted by means of charcoal, and tried the experiment of using coal as a fuel for his blast furnace. The result was that Britain's annual production of iron jumped, in the next fifty years, from a few hundred tons to one hundred thousand tons.

By the beginning of the nineteenth century, even the great and sluggish majority had begun to realize the fact that coal and iron were important; but the majority of men were content to point with pride to the accomplishments of the past, content with things of the then present.

Over a hundred years ago, an English inventor succeeded in making a practical horseless carriage. Far from welcoming the thing with open arms, the great majority of people considered the new monster so dangerous that they compelled the passage of a law requiring a man to walk ahead of the machine, not faster than four miles an hour, with a red flag. Which effectually disposed of the automobile idea, so far as the majority of people were concerned, but by no means stopped that small minority of engineers and inventors who finally gave us the motor car; today considered indispensable by the majority.

While the big and ponderous majority has slowly acquired a new viewpoint, it stops there—always it stops, content with things as they are. And always the small but persistent minority goes on: dissatisfied with the reciprocating steam engine, it produces the turbine; dissatisfied with the wastes involved in coal burning, it produces the oil burner and powdered coal burner; dissatisfied with the man-power method of handling materials, it produces the conveyor and the crane and the industrial truck.

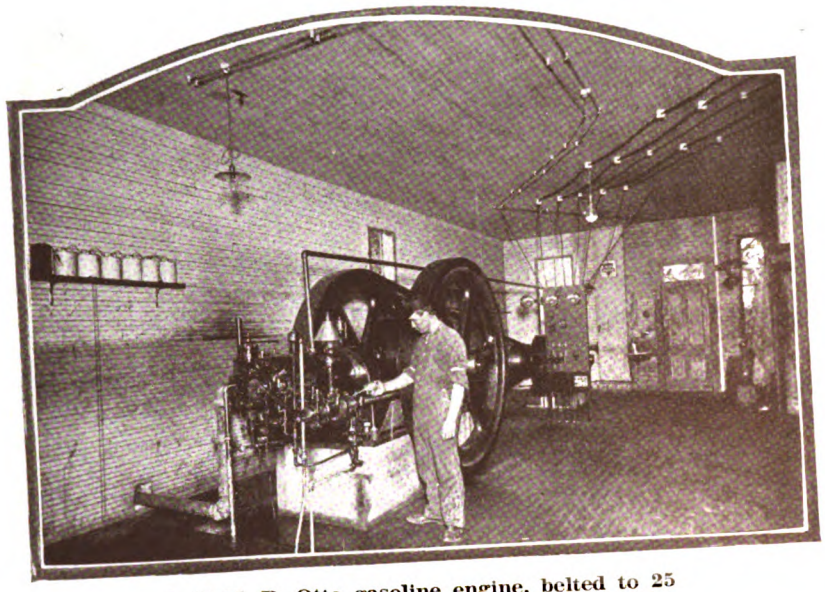
In any field of endeavor, a man must give due consideration to the majority. But the majority merely rules, it does not initiate. For progress, for new and better ways of doing things, we must look to that small group of human beings whose minds refuse to write finis under any achievement, looking always to better that achievement—the numerically small, but potentially overwhelming minority.

Digitized by Google

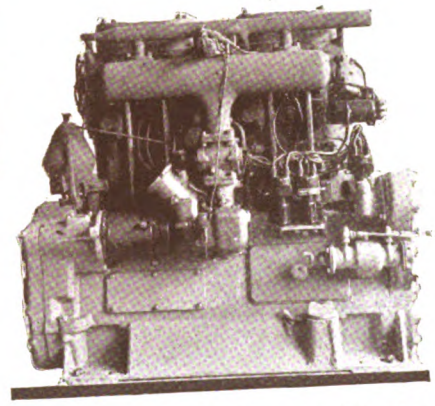
The Direct Route from Fu

How the Oil Engine Fits into the Prese

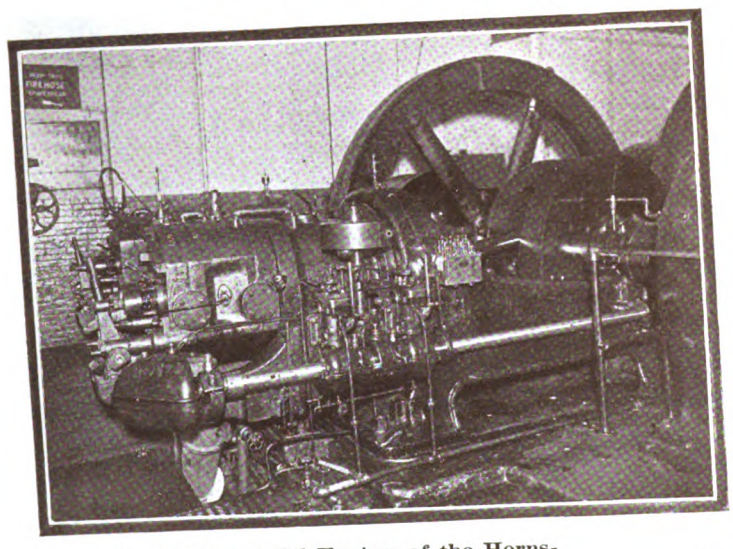
By W.



A 40 H. P. Otto gasoline engine, belted to 25 KW generator, supplying lighting current for the town of Concordia, Mo. Originally burning gasoline, this engine was converted to burning kerosene. The fuel cost is given as 2½ cents per KW.-hour, using kerosene.

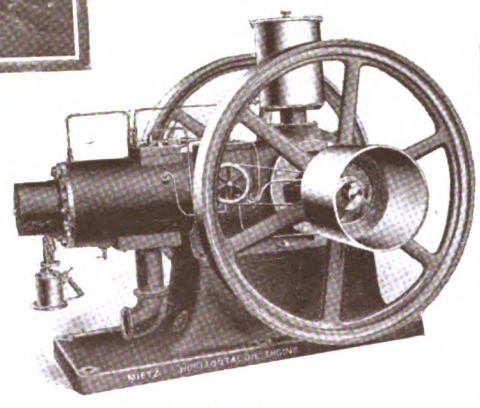


120 horsepower Sterling gasoline engine. These engines, in sizes from 75 to 340 H. P. are used for heavy duty tractors, railway cars, centrifugal pump drives and stand-by service.

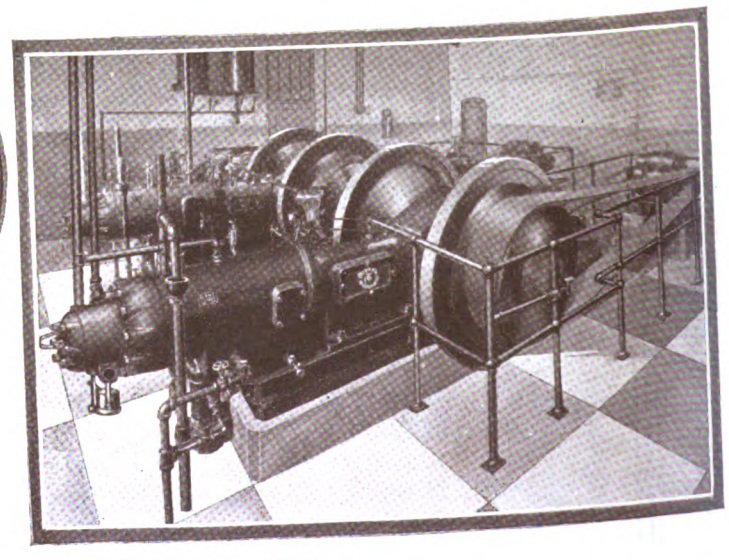


De La Vergne Oil Engine, of the Hornsby-Akroyd type, driving oil pump on an oil pipe line in Kansas.

At the right—Two "Giant" Oil Engines (made by the Chicago Pneumatic Tool Co.) direct-connected to electric generators.



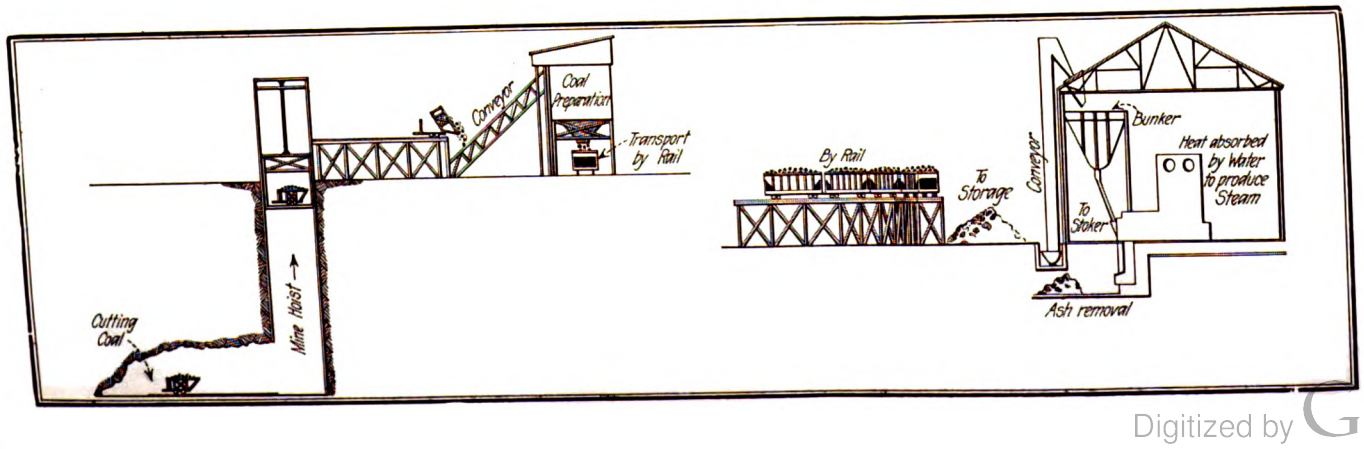
The Mietz Kerosene engine. Engines of this type still hold their own in the smaller sizes because of their simplicity.



BEFORE going into the qualifications or limitations of oil engines, perhaps it will simplify things if at the very start we state that those power users who *require an appreciable amount of steam in their processes,* are usually better off with steam plants; because the necessity for generating steam would probably offset any advantages to be gained from a non-steam power plant.

From the sole standpoint of power production, the oil engine is a more efficient convertor of fuel into power than is the steam-boiler-steam-engine combination. It is only when the factory has to use steam in processes aside from power generation, that this factor may—and often does—outweigh the possible economies of the newer power unit.

Admittedly, the modern oil-fired boiler is more efficient than the coal-fired boiler; saving in fuel costs and labor costs, and increasing the boiler rating. Stripped to its essentials, however, whether coal-fired or oil-fired, the actual job



The drawings at the bottom of these two facing pages show graphically the comparison between getting coal in its natural state, to the surface, and finally making it give up its power, and doing the same thing with oil. Note, on the left, the immense mechanical equipment and the labor involved, as compared to the process shown on the facing page at the right, where gravity and simple pumps do the work.

Digitized by Google

Fuel to Power

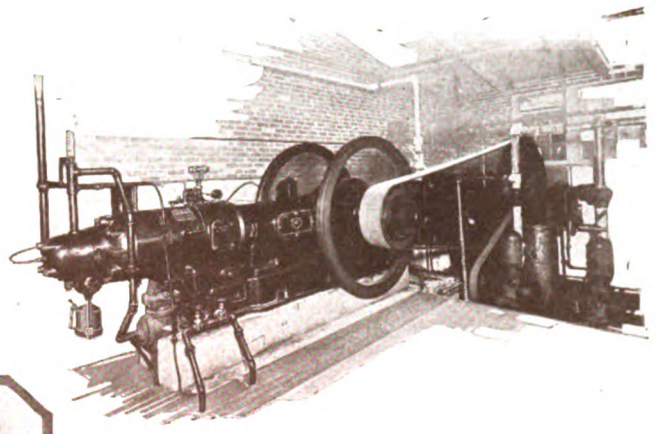
Present Day Power Situation

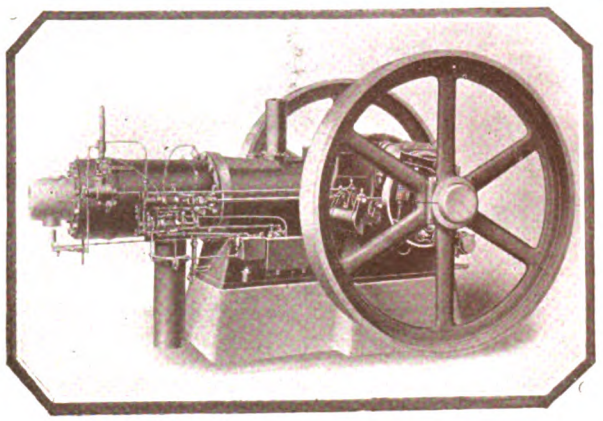
THOMSON LEES

of the steam power plant is *to convert the heat units in the fuel into power at the engine shaft.* And that is exactly the job in any power plant, whether reciprocating or turbine steam engine, gasoline engine, oil engine, or gas engine. The raw material is the fuel; the product is power; and the process which turns the raw material into power with least waste and at least cost, is the most efficient. That this fact was grasped a good many years ago, is proved by the numerous (unsuccessful) attempts to utilize pulverized coal as a fuel to drive a piston direct, instead of through the intermediate link of a boiler for generating steam.

Given a pound of oil, containing from 18,500 to 20,000 British thermal units, theoretically we want to convert as many as possible of those units into useful work. It is obvious that if we burn that pound of oil under a boiler, a certain number of those units will be required to heat the water to 212°—and these are wasted, because until the water reaches that temperature, no useful work has been done upon it;

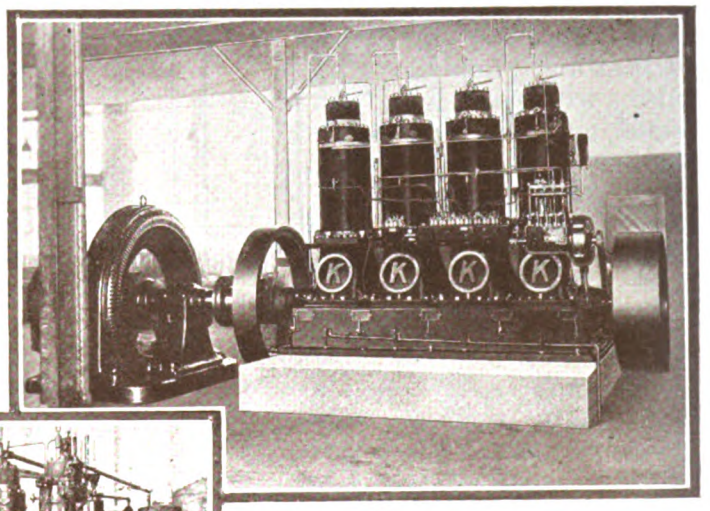
30 H. P. "Giant" Oil Engine in use at the Union Cold Storage Co., Gloucester, Mass.



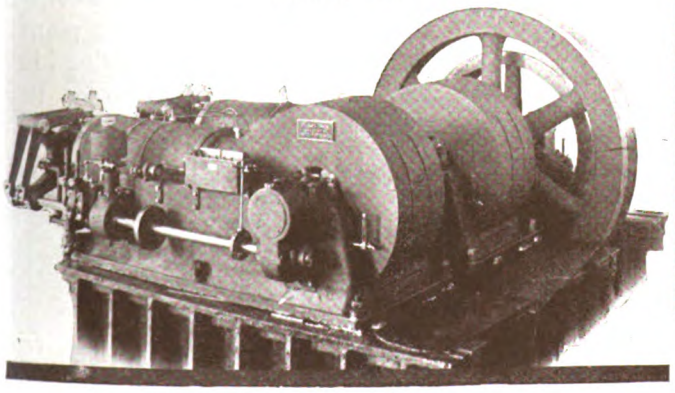


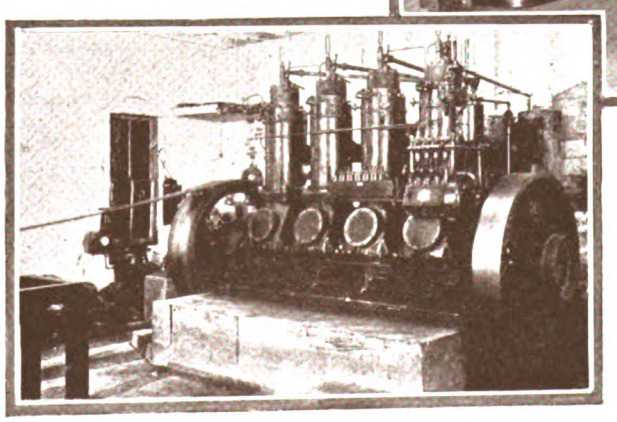
A Muncie low-compression oil engine employing the hot bulb for ignition. (See drawing on page 11)

Anderson semi-Diesel engine of 250 H. P. connected by flexible coupling with a Westinghouse generator.



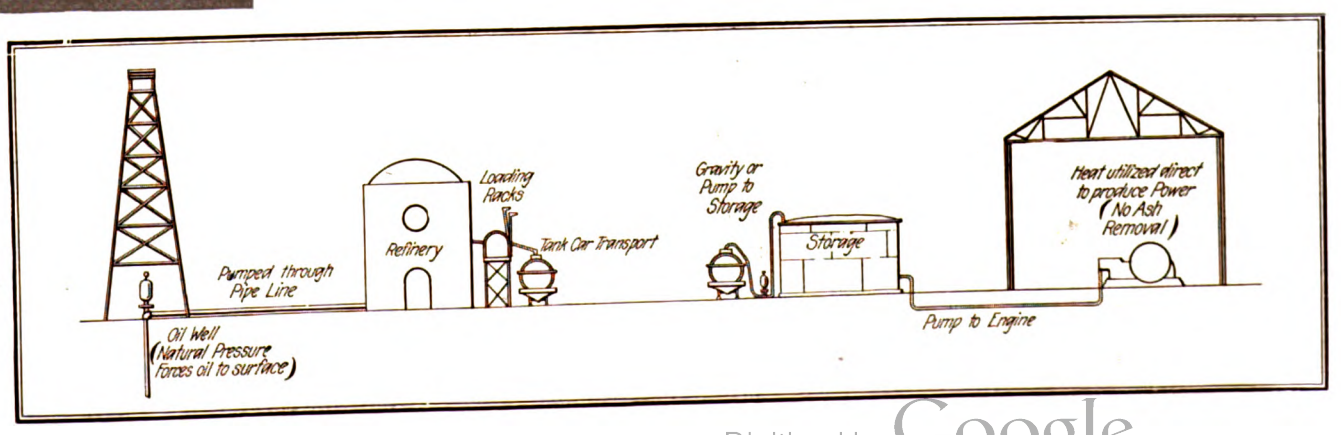
120 H. P. Anderson semi-Diesel engine at the Eunice Light & Power Co., Eunice, La.



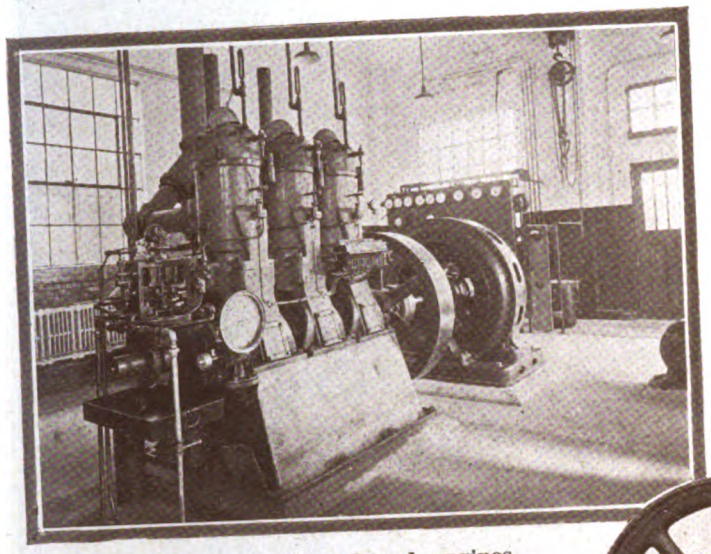


McEwen semi-Diesel engine for a Sugar Refinery in Porto Rico.

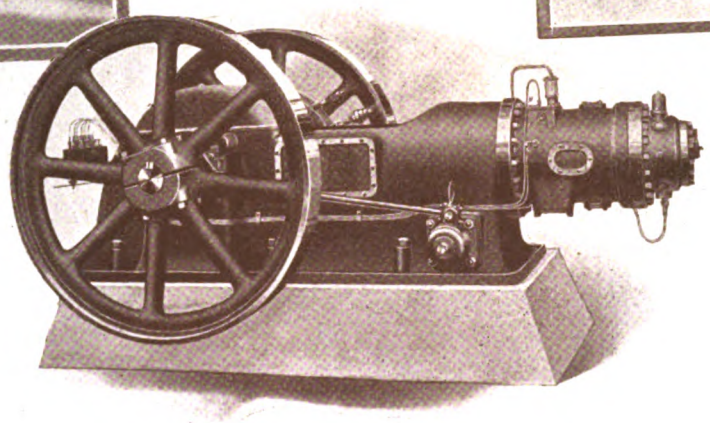
In comparing this drawing with the one on the left-hand page, it should be remembered that in neither case has account been taken of the heat units lost in the exhaust steam and in the oil engine exhaust gases, because in many cases a part of this heat is utilized. Although this is true to a greater degree of exhaust steam, this advantage is offset by the large heat loss in the stack of the boiler plant.



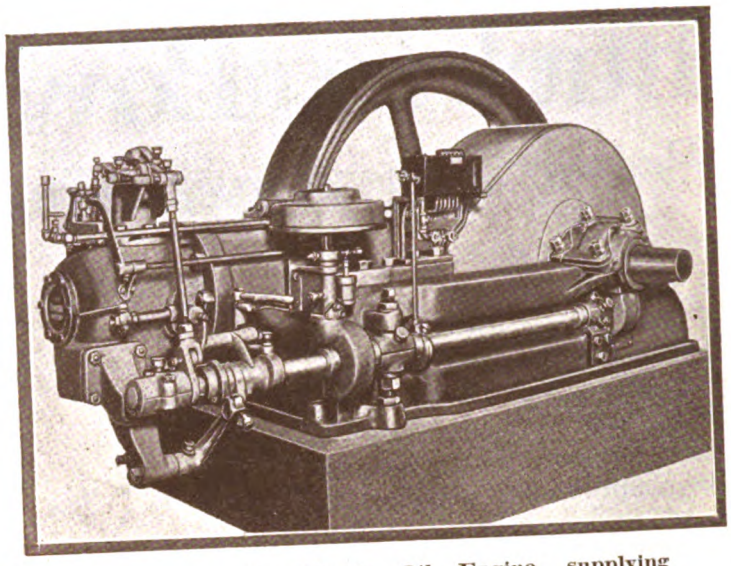
Digitized by Google



Venn-Severin semi-Diesel engines, used for peak load and stand-by service in a Canadian hydro-electric power plant.



A Bessemer Semi-Diesel engine arranged to drive a cotton gin.



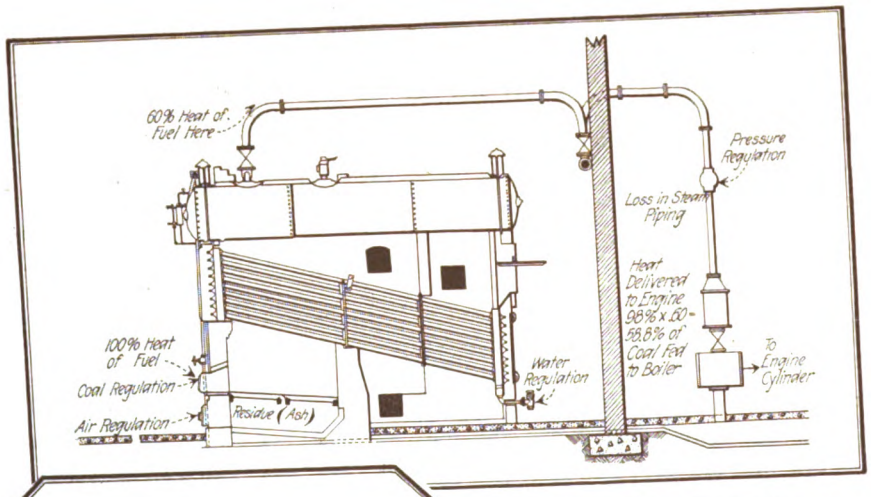
St. Mary's Oil Engine, supplying power in a yarn factory in Delaware.

the useful work commences only when the water is converted to steam. Even with the best of insulation, boilers waste a large amount of stored heat by radiation; there is further waste by radiation from the pipes leading to the engine; and more radiation wastes, from the engine itself. Last (and perhaps most important) are the stack and exhaust losses.

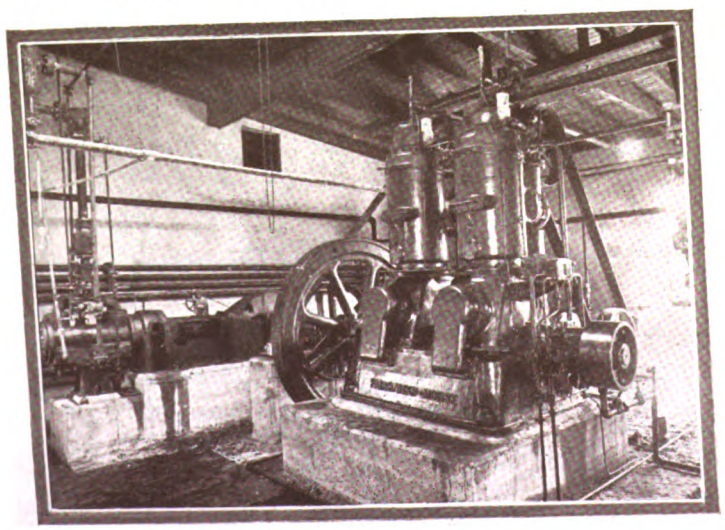
If we take that same pound of oil, vaporize it, and release its heat units, applying the resulting expansion directly to a piston, obviously there are less chances for waste of precious heat—and that, essentially, is why oil engines are more efficient than steam power plants.

It is true that the very large steam power plant, using turbines and equipped with the very latest thing in power plant equipment, can give the oil engine power plant of equal capacity a very good run for its money. But this means a plant of upward of ten thousand horsepower. Only in these large plants can steam make an equally favorable showing; and fully eighty per cent of industrial power plants are—and probably always will be—plants of hundreds of horsepower rather than of many thousand horsepower each.

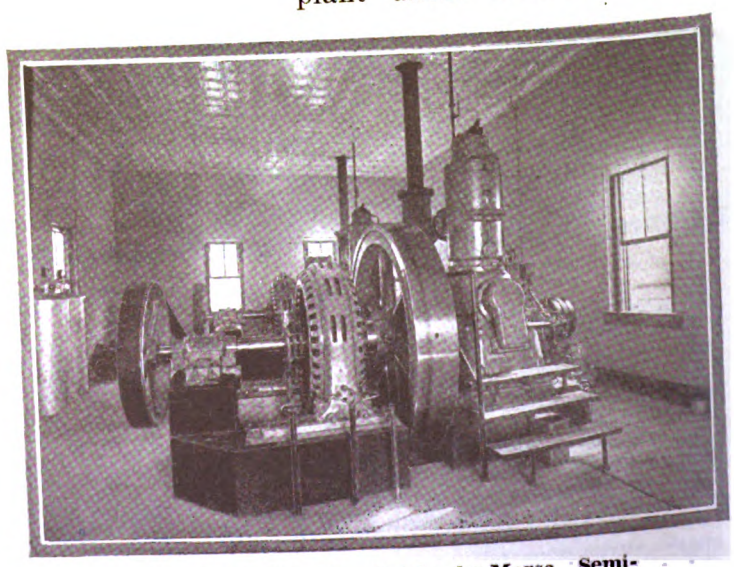
We know that only the very large central power stations, among steam plants, are able to show an efficiency of twelve to fourteen per cent. The usual industrial steam power plant—by "usual" we mean the average of all but the very few plants of thousands of horsepower rating—runs at an efficiency (at best) of 8 per cent. Against this, the semi-Diesel oil engine, in actual operation in hundreds of plants, shows an efficiency of more than 22 per cent, while the Diesel yields up to 35%. So that, in the matter of fuel alone, the oil engine gets about three times as much power per fuel dollar as the steam plant; this, of course, varying inversely with the size of the plant under consideration.



Another graphic illustration in the way of comparisons: the "direct route" is here brought out clearly, as contrasted with the steps necessary in utilizing the heat units of coal to produce power.

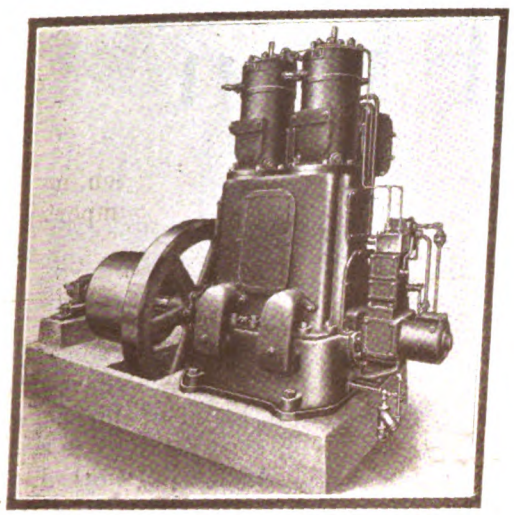


Fairbanks-Morse 100 H. P. Semi-Diesel engine driving an ammonia compressor, at the Red Bank (N. J.) Pure Ice Mfg. Co., Plant

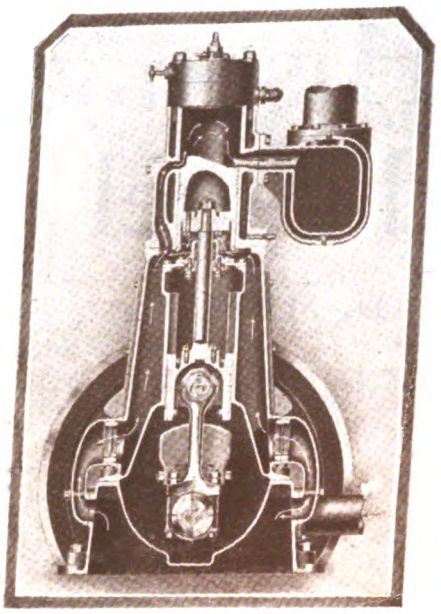


Two 50 H. P. Fairbanks-Morse Semi-Diesel engines direct-connected to 40 KW. Fairbanks-Morse generators, supplying electric light and power, at the Strawn Coal Co., Strawn, Texas.

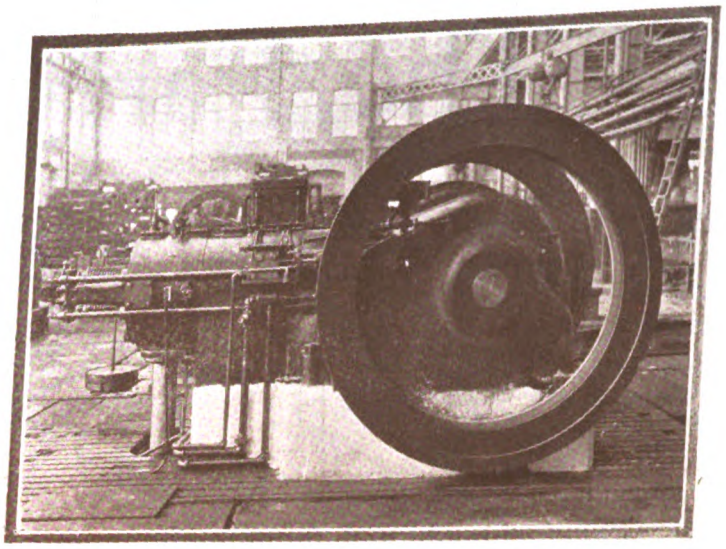
Digitized by Google



A Worthington Solid-Injection type oil engine, used in a Texas plant for pumping on an irrigation project.



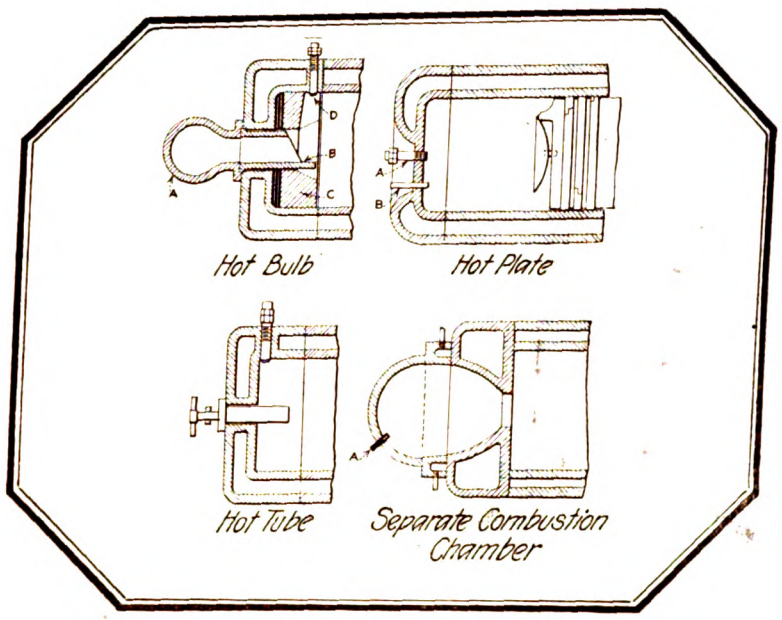
Cross-section of the same engine as shown on the left, illustrating the combustion chamber and giving a good idea of the working parts.



85 H. P. Ingersoll-Rand solid-injection type oil engine.

Against this, must be considered the fact that in general the first cost of an oil-engine plant is higher than for a steam power plant; the increase being greater in the larger units than in smaller ones.

When we then compare the labor charges (which are in favor of the oil engine) and the probable depreciation, we have figures—all easily ascertainable—which will give both the fixed and the operating costs for either kind of power in a given plant. It would surprise many conservative power engineers to learn in how many cases this analysis would dictate the abandonment of steam power. But it must be remembered that, in addition to giving better thermal efficiency, the oil engine uses a fuel which comes out of the ground without man-power assistance, flows through pipes to refinery, and is pumped through pipes to the engine—involving none of the tremendous labor of transportation and none of the dirt associated with coal, and leaving no ashes to be disposed of.

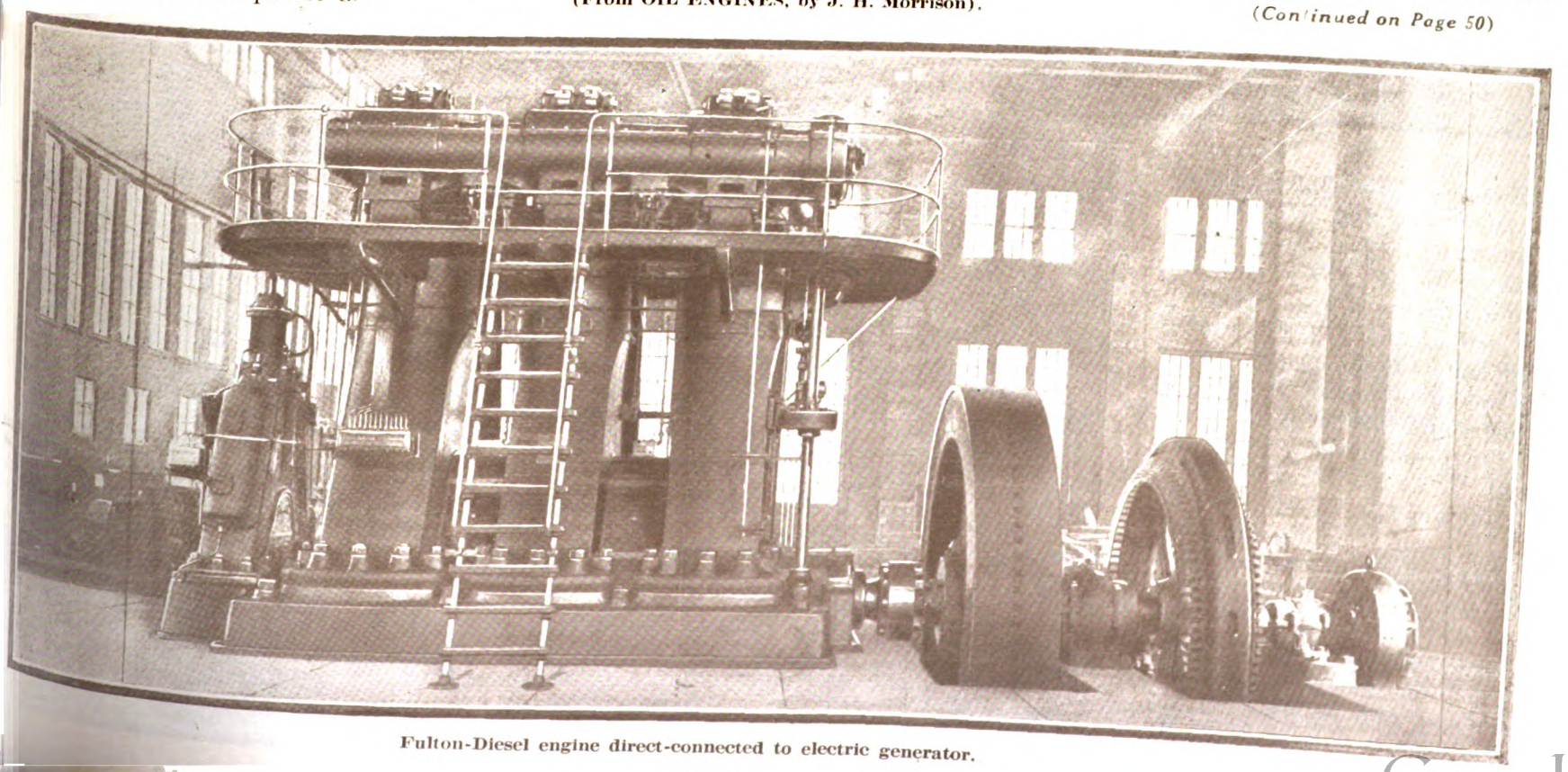


Ignition devices of low-compression engines (From OIL ENGINES, by J. H. Morrison).

Another thing the conservative power engineer should bear in mind is this; in a steam plant, there are three factors to be regulated for varying loads—air (draught), coal and feed-water. The more nearly automatic the regulation of these three, the more expensive is the equipment required. The oil engine has but one factor to regulate—the fuel; and this is accomplished automatically by the governor.

Various types of internal combustion engines have been put on the market for a long period of years under the

(Continued on Page 50)



Fulton-Diesel engine direct-connected to electric generator.

Digitized by Google

The Early History of Iron and Steel

By H. H. Manchester

WHETHER iron was known to the Egyptians at the dawn of history, some 5500 years ago, is still a question. An iron plate was found not many years ago between two stones within the great pyramid of Gizeh. If it was put there when the pyramid was constructed, it dates back to the Old Kingdom of Memphis. A few iron tools have likewise been discovered in the pyramid of Una, and an iron sickle has been discovered from beneath the feet of the sphinx. All of which, if not later deposits, would prove that iron was known at the beginning of civilization.

But such relics are very few, and notwithstanding the effect of rust in destroying iron entirely, one would expect, if iron were then common, that such finds would be far more numerous.

There is also almost no certain mention of iron in the hieroglyphics of the Old Kingdom of Memphis, and it is safe to say that if iron were then known its use was very rare. That was, in fact, an age first of copper and then of bronze. The only aids to smelting were blow pipes worked by human lungs, and this in itself would make the smelting of iron difficult.

But when the New Empire of Thebes was established, some 3600 years ago, the evidences of the use of iron become numerous and unassailable.

An inscription of Thothmes I, mentioned bars of iron and cubes of iron from the mountains. Several thousand little iron statuettes dating from that period have been discovered, and many of them were apparently cast.

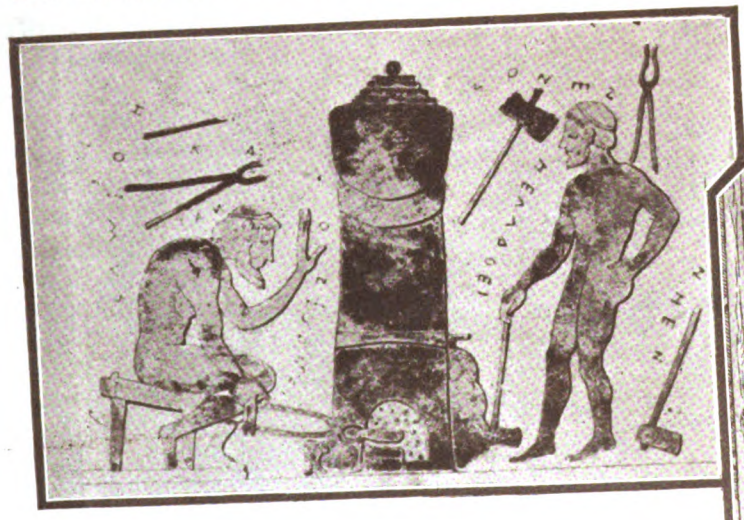
This may have been made possible by a highly important invention which we have already illustrated in this magazine. This was the goat skin bellows, which were worked by treading upon them with the feet.

Iron was already smelted in southwestern Asia. In the Vedic Hymns, which date somewhere between 1000 and 2000 B. C., we read of iron swords, and arrows tipped with iron, though perhaps the translation should be merely metal instead of iron. Probably the most significant passage is where the Rig Vedas speak of Agni "burning the woods, smelting them like a smelter," which at least implies the power of the smelter of the time.

There is little doubt that the Hindoos knew of wootz iron, which was a sort of wrought iron used for fashioning weapons that were afterwards hardened into steel, from a very early date. The Vedas, for example, speak of Agni "whetting his rays of splendor like an edge of iron." It was the possession of such improved weapons that facilitated their conquest over the non-Arian tribes of India.



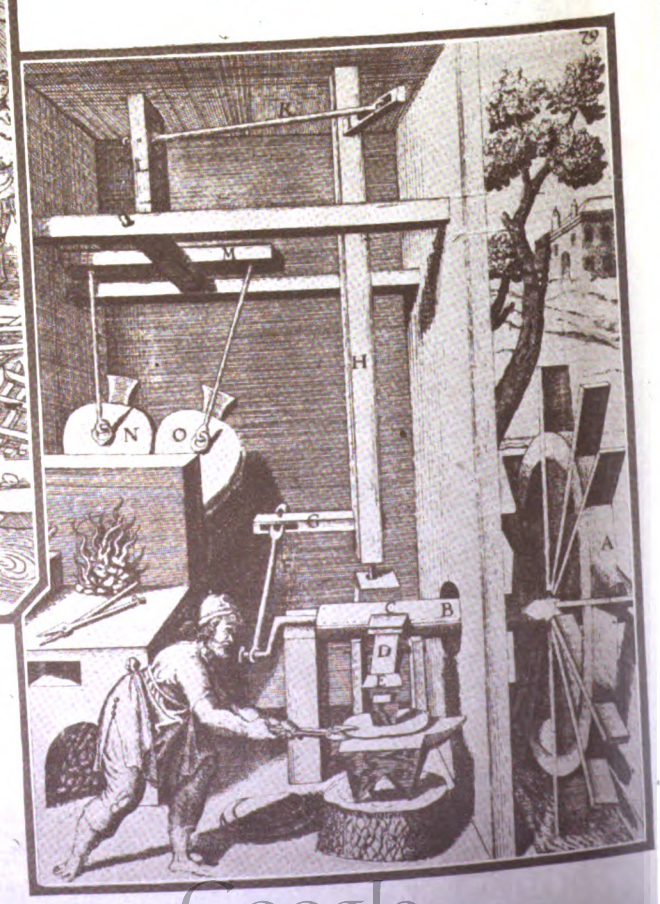
The ancient Greek Blacksmith—from a vase painting.



The Stack Furnace, as used in ancient Greece—from an archaic vase.

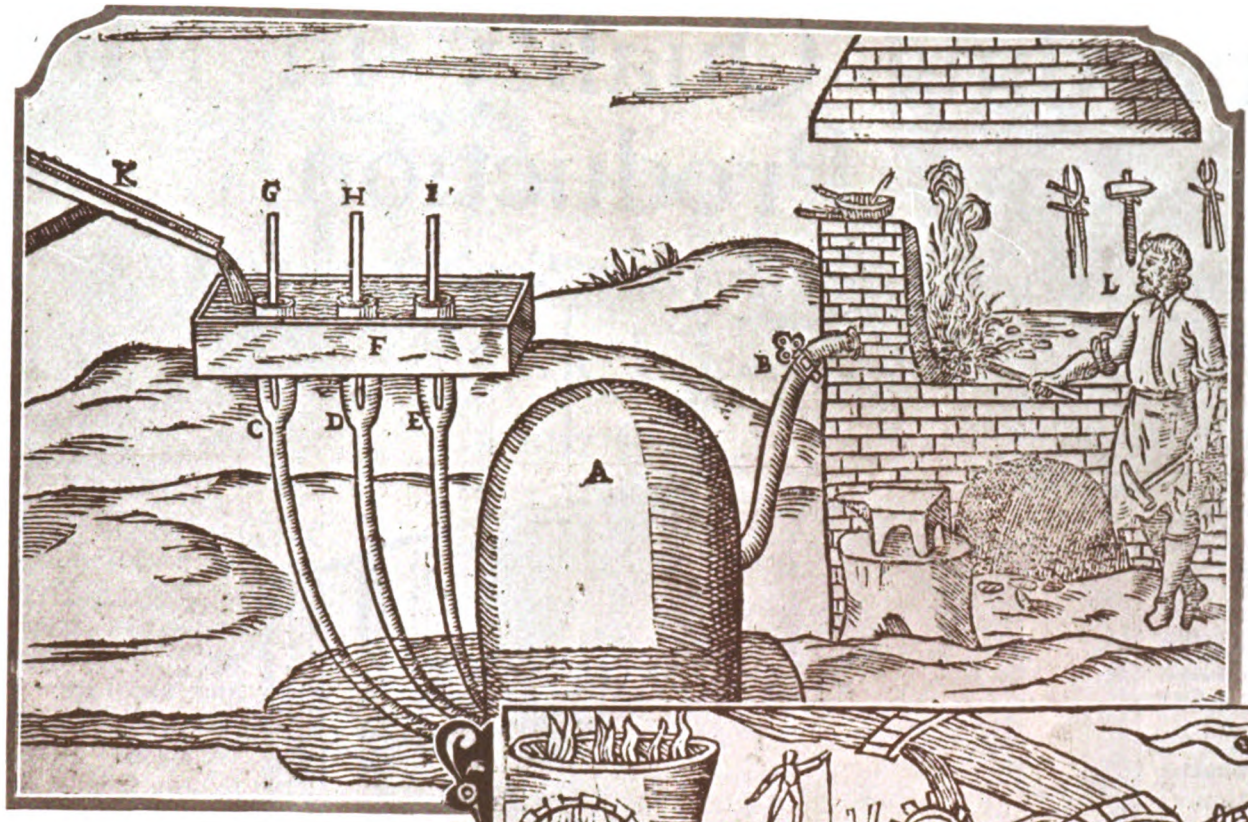


A furnace and small trip-hammer, 1556, from Agricola.

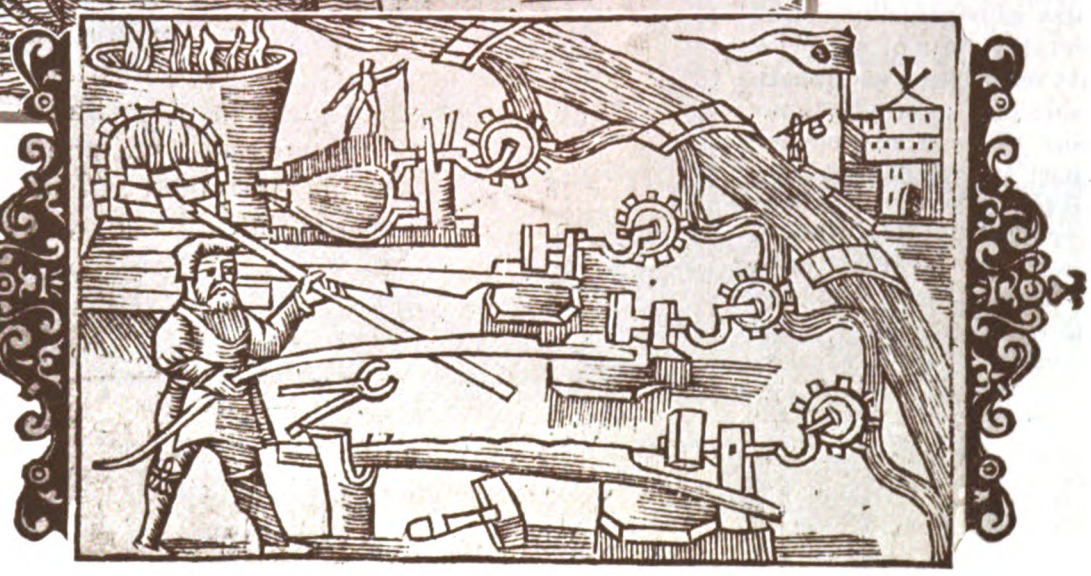


An arrangement for using a water-wheel to run two blacksmith's bellows.

Digitized by Google



A Sixteenth Century installation of the Catalan Forge, with the air for the blast brought down by the Stream.



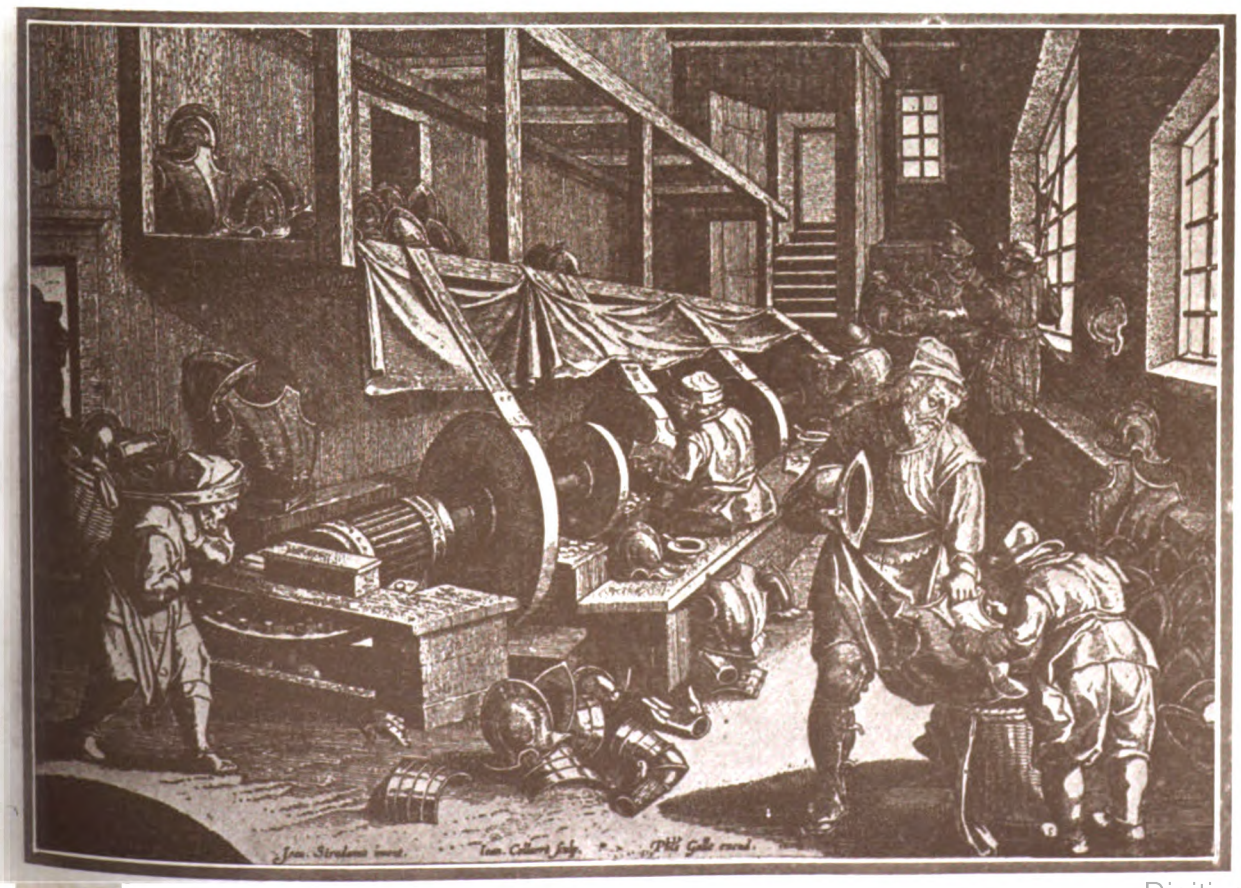
Water wheels for smelting and forging—1555—as used in Sweden.

The Babylonian name for iron meant "stone from heaven," which is good proof that the origin of their first known iron was meteoric. Later they developed the use of iron sufficiently so that Place collected about 150 tons of iron relics from Nineveh.

A knowledge of iron at the time was of great military value. It is told in Judges, for example, how the Jews "could not drive out the inhabitants of the valley because they had chariots of iron."

The making of steel was certainly known at the time.

Interior of an armor plant, 1575—a large factory for this period.



Homer, for instance, speaks of how "The ax hisses loudly when some smith plunges it into the cold water to temper it, for such is the strength of iron."

Whatever was the first form of the iron furnace, there is no doubt that as early as the 6th Century B. C., the Greeks had developed a sort of cylindrical stack furnace. There are several vase paintings which illustrate this furnace. In each of them there is a bellows at the back, and a cylinder about the height of a man. On top of the cylinder is what appears to be a kettle. This was probably used for smelting copper or bronze, for it must be remembered that the smith at the time worked in this as well as iron.

Pausanias recorded the tradition that Theodorus, the Samian, about 520 B. C. first found the method of casting iron into images. This may have been true as far as the Greeks were concerned, but the

(Continued on Page 56)

Digitized by Google

Safeguarding Quality in Motor Car Production

"Super Supervision" and Flying Squadron Inspection at the Packard Plant

By John H. VanDeventer

THE science, profession or art—whichever you wish to call it—of inspection, owes a tremendous debt to the motor car. In fact the development of the automotive industry is responsible for the present day state of inspection and its recognition as an indispensable part of production.

Those of us whose memory goes back to shop days, prior to the automobile, recall the inspector and the inspection department as entirely unlike their present day semblance. Inspectors were usually elderly men with gray whiskers, glasses, an extensive knowledge of shop practice—graduates from the shop and tool room who were proficient with micrometers, vernier calipers and surface gages. Their work was slow, tedious, painstaking and accurate. Today the inspector is frequently a bright young lady who does not know a lathe from a milling machine, but whose work is easy, rapid and very accurate.

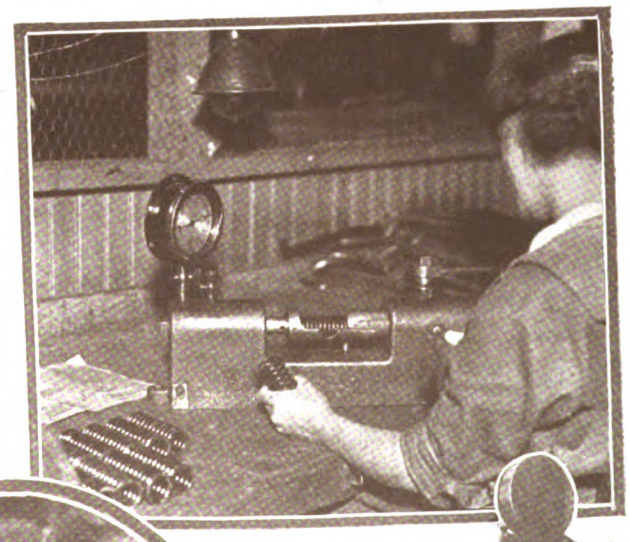
Quantity production and the



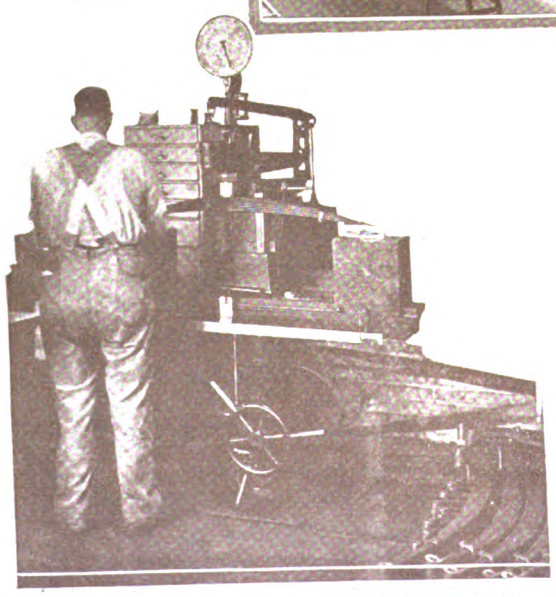
At the left is one corner of the central inspection room. Here such parts as valves, piston rings, ball and roller bearings and other light parts are inspected. Women inspectors have proven very successful for this work which requires delicacy of touch, speed and accuracy.



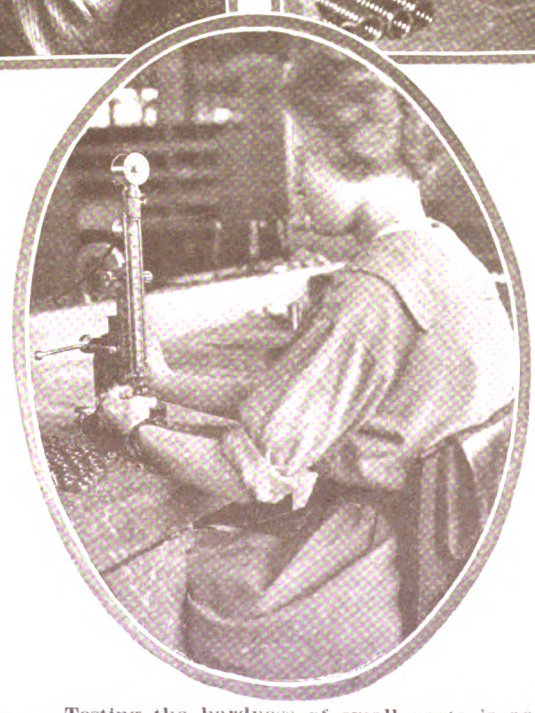
To the greatest possible extent apparatus has been devised so as to make inspection nearly automatic. At the right in this picture is the ring-gap gaging fixture in which rings are compressed to cylinder diameter size so the gaps may be measured by feelers. The operator at the center is checking ring thickness on the micrometer indicating dial while the girl at the left is testing width of rings in the simple go and no-go slot fixture.



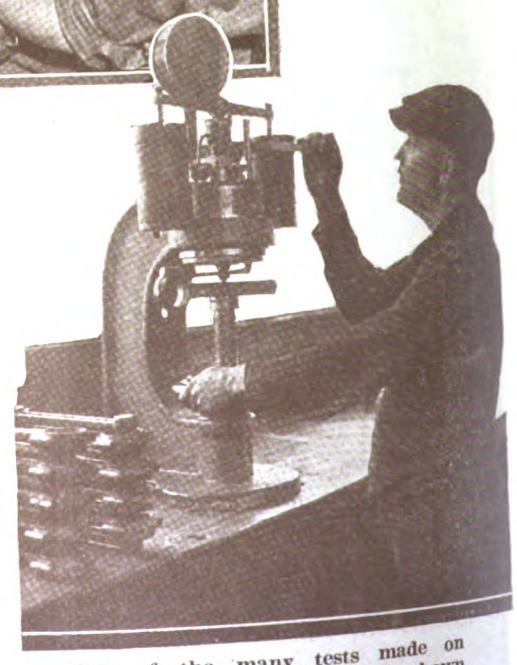
Valve springs are tested as shown at the left in a device which shows the number of pounds pressure exerted at a given degree of spring compression.



Axle springs have a great deal to do with easy riding qualities. They are tested in the machine here shown, which not only indicates the amount of pressure required to deflect them but also the degree of "come back" after the load is removed.

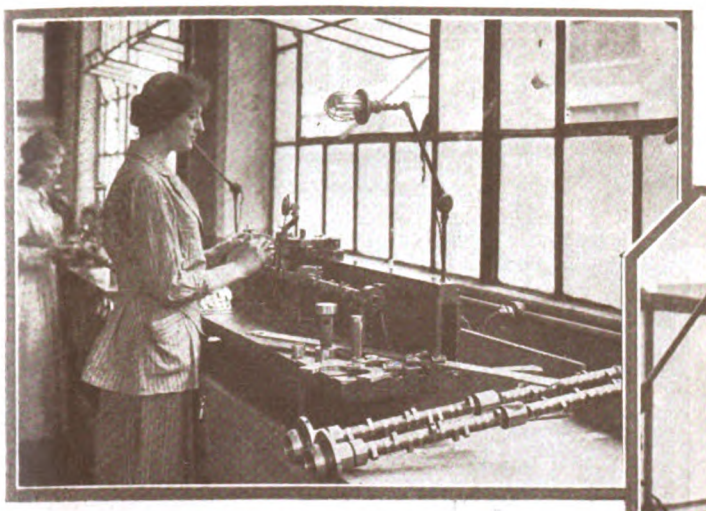


Testing the hardness of small parts is accomplished by noting the height of rebound of a small steel ball in the instrument shown above.

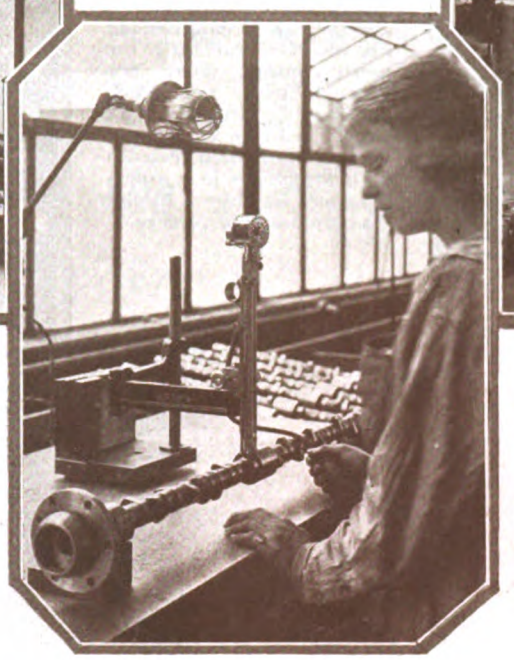


One of the many tests made on Packard connecting rods is shown here. This hydraulic testing machine indicates by the indentation made under a given pressure the hardness and ductility of connecting rod forgings before heat-treating.

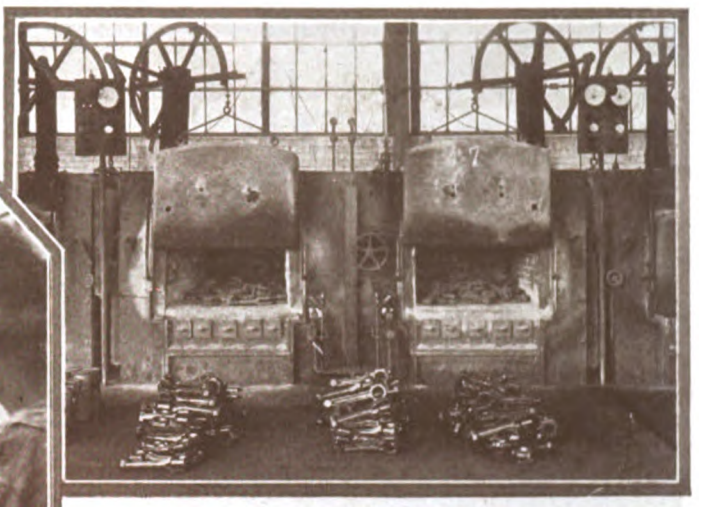
Digitized by Google



Every dimension of camshafts and crankshafts is rigorously checked. Ingenious indicating devices, such as shown above, test the amount of throw of each cam and also the concentricity of camshaft bearings. Snap and plug gages, such as are shown on the bench, check diameters simply but accurately.



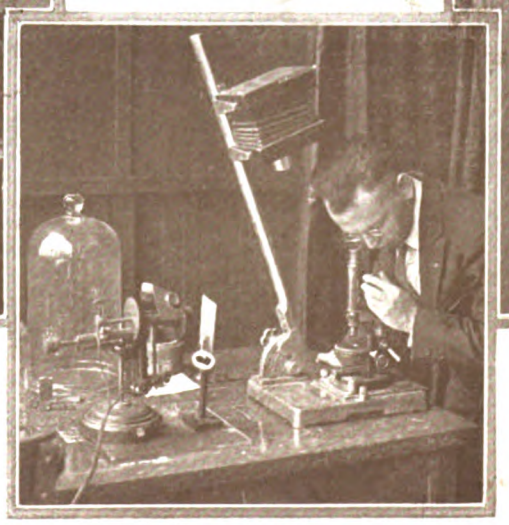
(At left) Testing the hardness of a cam surface on a Packard camshaft.



Here are two of the big battery of heat-treating furnaces where forgings are given the high degrees of strength required to withstand repeated strains. Note the electric signal lights and the pyrometers on the instrument boards at the top. Through these lights a 10-degree variation in oven temperature is signalled to the operator.



The metallurgist and the chemist play extremely important parts in protecting the quality of modern motor car production. This illustration and the succeeding one show portions of the chemical laboratory and the micro-photographical laboratory.





This picture taken in the pyrometer room beneath the heat-treating department shows the graphic recorders which keep tabs on each furnace and oven. The readings are checked up every ten minutes and signals flashed to those ovens which are above or below temperature.

necessity of individual inspection of each piece have brought about this change, through the development of tool and gage engineering. The inspector of today does not measure; he or she checks measurements. The measuring is done in the tool room *once* in making the "go" and "not go" gage, and serves for one thousand, ten thousand or fifty thousand inspections of that dimension, or until the the gage becomes worn out and is replaced by a new one.

In other words, inspection has become specialized, mechanicalized and reduced to an automatic routine—*almost*. The qualification of "almost" is necessary because many concerns have been defeated in their battle against noise and wear by considering that the matter of inspection had become a perfected routine, and letting it go at that.

Probably no better example of well developed inspection methods could be chosen than the Packard Motor Car Company, of Detroit, some of whose inspection and testing methods are shown pictorially in this article. The engineering staff of this company has developed inspection to a high degree. It has provided its inspectors with ingenious measuring and testing fixtures in which such important parts as crankshafts and camshafts are verified in every dimension with exacting precision, but with a minimum of time and labor. By so doing, it has reduced inspection to routine—but has not mistakenly let it go at that.

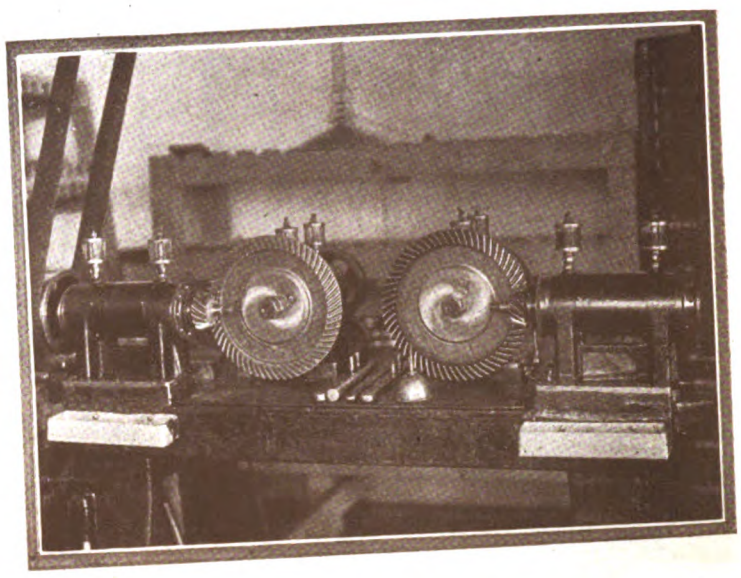


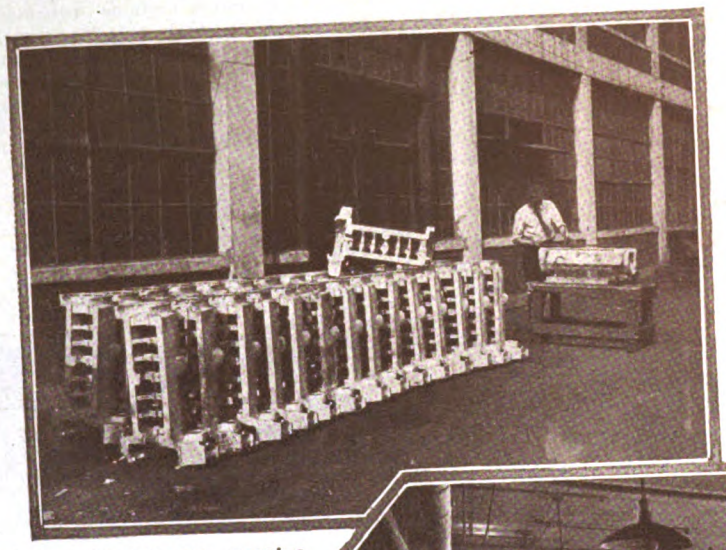
General view in the heat-treating department.

Digitized by Google

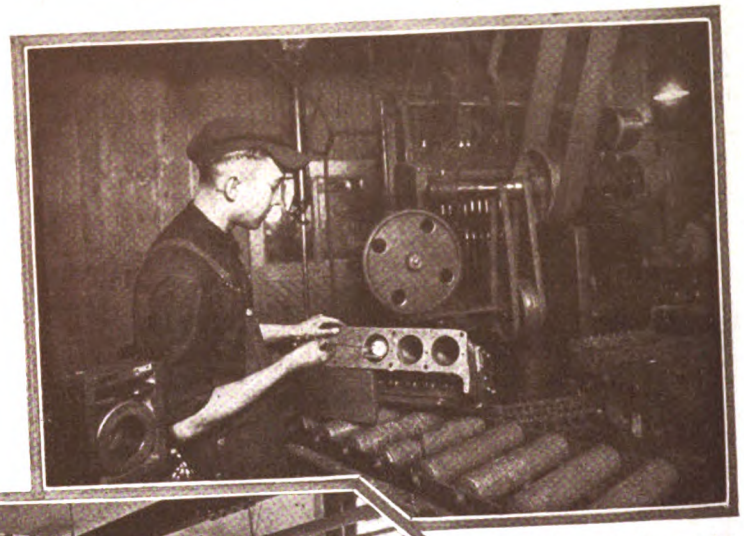


In addition to gaging, indicating and hardness testing, spiral, bevel and pinion sets both before and after heat-treating are checked carefully for tooth contact. They are spotted with red lead, matched, stamped in pairs, hardened and ground and then run in both directions in a quietness test as shown in the accompanying picture.

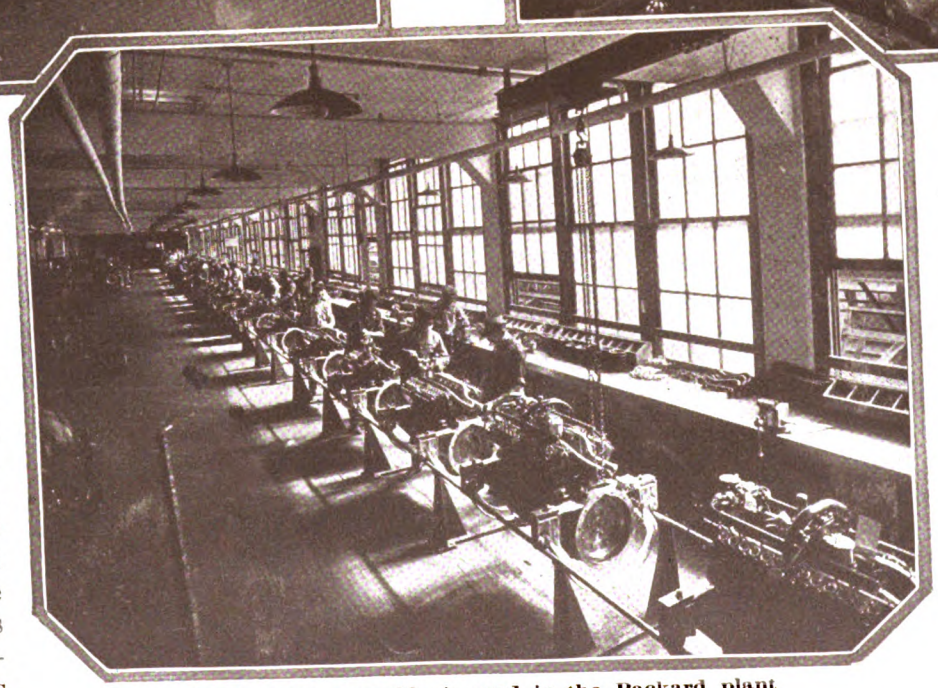




Aluminum crankcases receive an inspection which requires the use of from 15 to 20 different gages.



Checking the bore of a cylinder by means of a three-point bore indicator.



Progressive assembly is used in the Packard plant for twins, single sixes and truck motors. Note the ingenious yet simple rail system with the roller carriages for carrying cylinders along the line.



The stethoscope test in a quiet room is an interesting feature of Packard motor inspection. It indicates the extent of precautions taken to make the modern high grade motor car both quiet and long-lived.

For the battle against noise and wear in the high grade motor plant is and must be both aggressive and progressive. No matter how much we think we know today we find something new tomorrow. And, again, the requirements of motor car users has become progressive, due to education and use. What seems to be perfection today, in quietness and endurance must be surpassed tomorrow. Thus comes progress.

So at the Packard plant there has been organized, as part of inspection, a branch of super supervision, so to speak, in the form of a flying squadron of inspectors whose qualifications are much higher, in the way of experience, training and judgment, than those necessary for routine inspection. Each of these super inspectors is assigned to a certain branch of activities. Thus one man devotes himself to body work, another to motors, another to gears, etc. One function of these men is to keep moving about and to find trouble before it starts. Another is to make suggestions for progressively improving the routine inspection in their respective fields. They, themselves, have no routine duties, and their authority permits them to shut down any machine, operation or department or to stop any work which in their judgment is not being properly carried out. Naturally this authority does not have to be often exercised, but the fact that it exists is a powerful stimulus to careful workmanship and to close routine supervision.

Inspection of small manufactured parts and purchased materials such as roller bearings and the like, is carried out in the general inspection room. Girls are largely employed on this work. Ingenious devices have been built in the tool room in the way of holding fixtures, indicating dial fixtures, etc., so that a large number of pieces can be accurately checked for size, concentricity and hardness at a rapid rate.

Advanced metallurgical practice characterizes Packard production. Particular attention is paid to the differential ring gear and pinion set, the blanks for which are forged

(Continued on Page 40)

Digitized by Google

From Inventor-Manufacturer to Scientist

Charles Francis Brush, Who Perfected the Storage Battery and the Arc Light

By Ernest H. Rowe



Charles Francis Brush, successively (and simultaneously) inventor, manufacturer and business man, whose idea of retirement consists in devoting himself to scientific research. Mr. Brush invented the first practical arc-light, in 1876, before he was thirty years old. In 1881 he perfected the storage battery, obtaining basic patents which cover all practicable forms of that important device. At the age of fifty, Mr. Brush withdrew from active connection with his many business interests in order to pursue his "hobby"—though it is more than that word implies—of laboratory research.

SCIENCE, we are told, is organized knowledge. Manufacturing is applied science. Business is the indispensable art of finding and serving the greatest possible number of users of the products of manufacture. Most of us do pretty well if we are good at any one of those three activities, especially the last. The business man, when he is big enough, can hire his science and his manufacturing; but still he has to go out and hire it. Charles F. Brush has never had to. He is scientist, manufacturer and business man, all by himself. When to the imagination, resourcefulness and patience of the inventor a man adds the ability to organize production of his inventions and then adds again merchandising competence, that man commands confidence, he commands money, he commands success.

Before he was thirty, in 1876, Brush invented the first practical arc light in the world. He put a collar on the carbon pencil, which acted as a feed controller. Two years before that, one Hays had experimented with a collar, but he apparently lacked the thoroughness in his inventive procedure which is characteristic of Mr. Brush, and struck off in some other direction, which led nowhere. Forty years ago Prof. E. P. Thompson wrote a long essay on the "Analytical and Systematic Method of Inventing." Charles F. Brush surely followed that method, for he has been granted over fifty patents, mostly for devices essential to electric engineering, and fully two thirds of them have proved commercially profitable in a high degree. For example, when his dynamo with a cast iron core in its armature supplied the current for forty lights, he substituted wrought iron, rotated the armature a

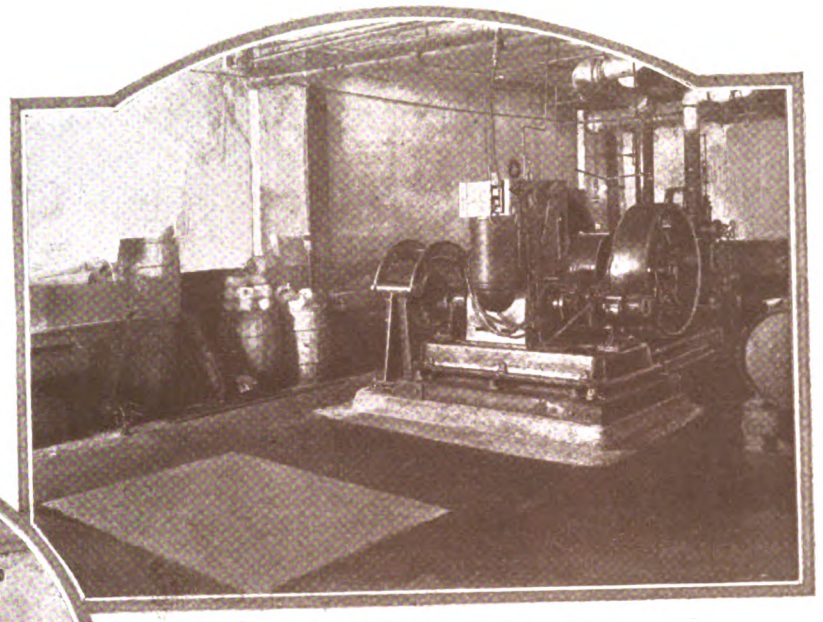
(Continued on Page 28)

Digitized by Google

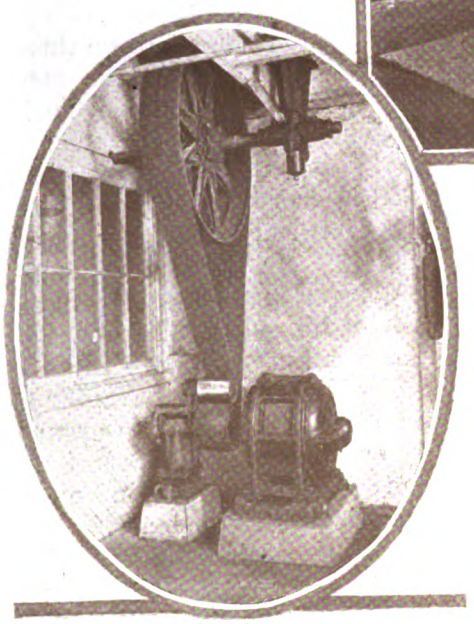
Evolution in Belting Practice

Some Accomplishments of the Short-Center Belt Drive

By Viggo Sahmel

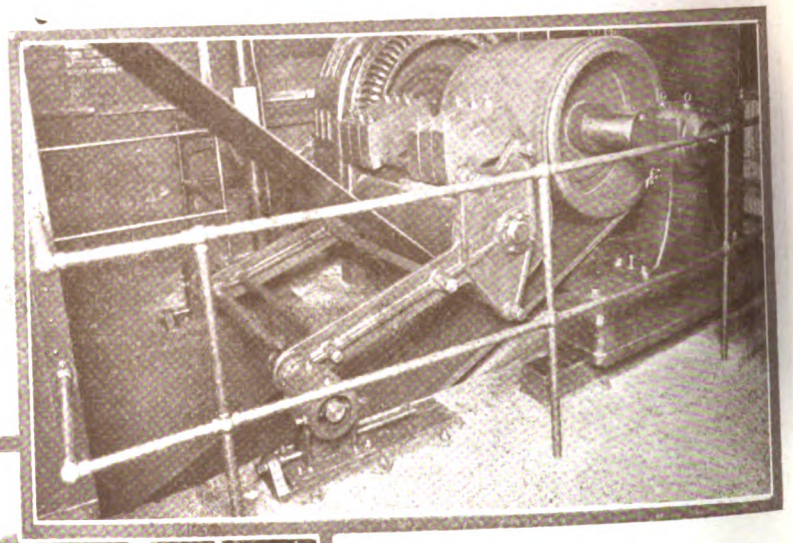


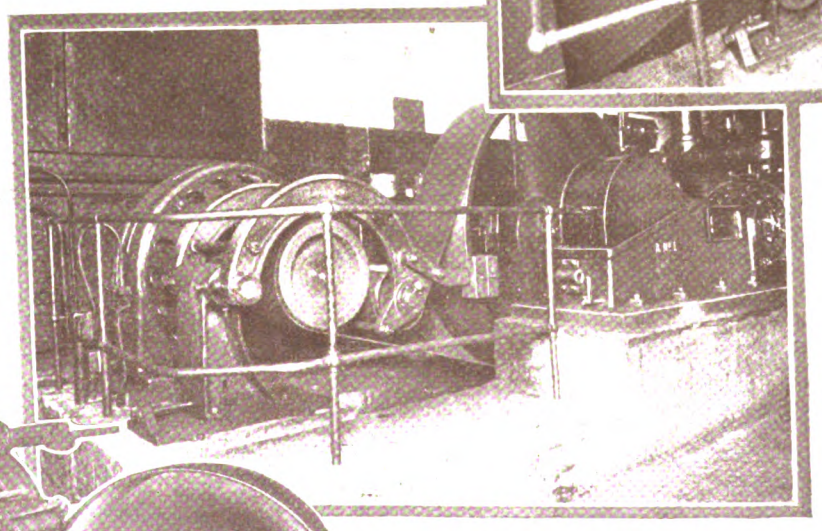
Installed in 1908, this drive is still in successful operation. The space at the left of the photograph shows where the generator stood originally, giving an idea of the pulley centers necessary with ordinary belt drive.



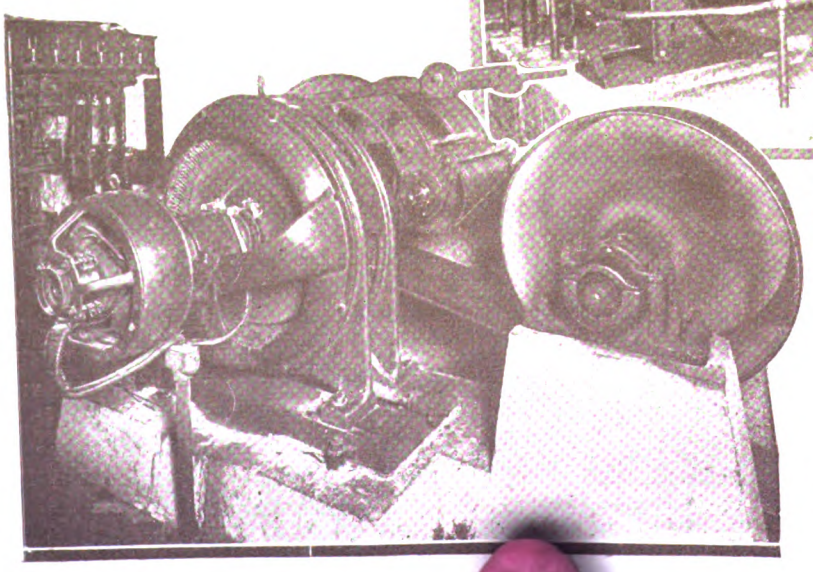
A vertical 35 H. P. drive at the Susquehanna Silk Mills, Milton, Pa.

At the right—A 500 H. P. drive on an ammonia compressor at an ice plant. Here, the problem was to install an electric drive in the space formerly occupied by a steam engine. Compressor pulley is 20 ft. diameter, and pulley centers are 20 feet.





Another compressor drive, of 150 H. P. Note the large arc of contact.



At the left—A water-wheel-driven electric generator at the Warren Mfg. Co., Phoenix, Md. This belt is transmitting 300 H. P.

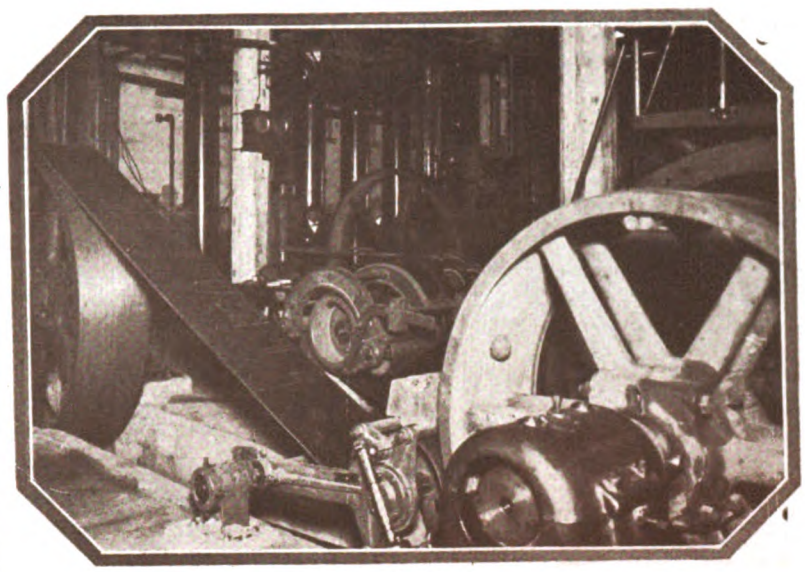
As an introduction to this subject it may be worth while to study the interesting article, "The Evolution of Anti-Friction Bearings," by Philip C. Gunion, in the September issue of *Industry Illustrated;* particularly, some of the reproductions of paintings, bas-reliefs and drawings, which date back several thousand years B. C.

The use of ropes in connection with pulleys or rollers is quite in evidence, proving conclusively that the use of ropes and pulleys for the transmission of power is an art nearly as old as man.

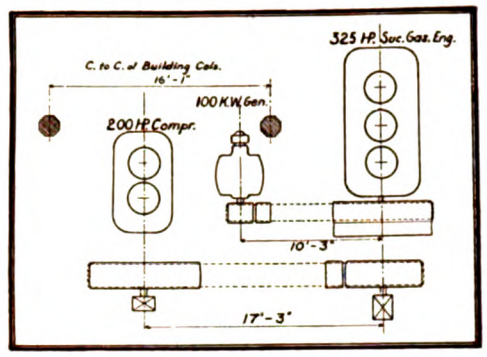
A close examination of the quaint engraving, dated 1500 A. D. on page nine of the above mentioned article, shows a man working a two-bucket well hoist and will illustrate certain important points to be referred to later.

The rope, it will be noticed, is not laid one turn only around the driving drum, but eight and one half turns will be counted. As a consequence, the full *arc of contact* between the rope and the drum is 8½ x 360°. The designer at that time evidently knew that without this great *arc of contact* and its consequent great frictional resistance between the rope and the pulley, the empty bucket would not go down and the full bucket would not come up. It would have been a different matter in case the bucket in the high position had been *full* and of about the same

Digitized by Google



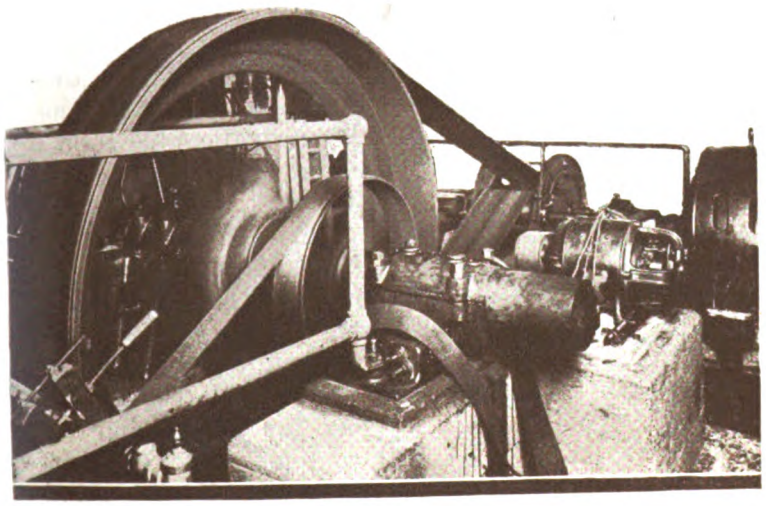
A 325 H. P. Suction Gas Engine driving both a compressor and a 100 K. W. generator. One of four sets in the same plant.



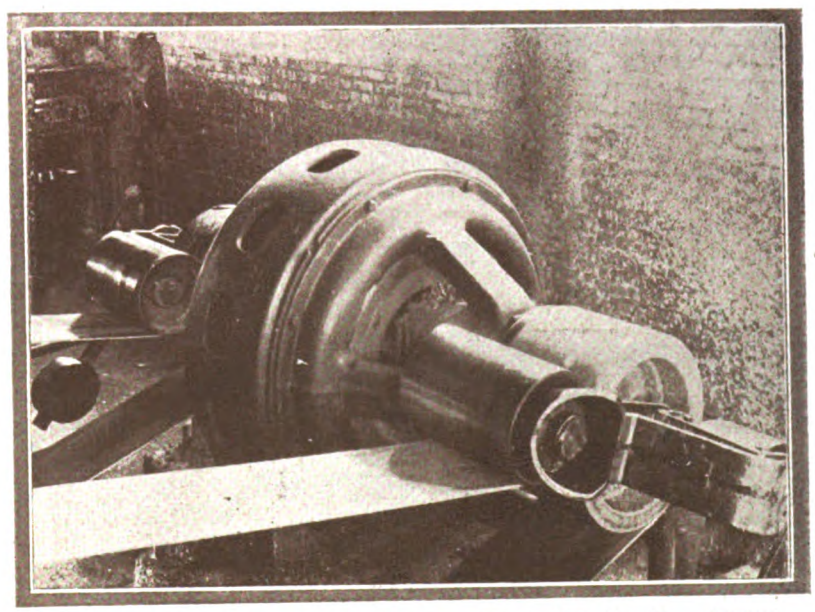
This shows the layout of the unit illustrated at the left.

weight as the lower bucket; one half turn, or 180° arc of contact would then have been sufficient. However, under these circumstances, the *initial tension* in the rope would be equal to the weight of the bucket or the power to be transmitted.

With the upper bucket *empty* the *initial tension* in the rope is naturally reduced to a fraction of what it was before, but by increasing the arc of contact eight and one half times, the grip or frictional resistance between the rope and the drum is increased enormously—not eight and one half times and not the equivalent of the weight of the empty bucket raised to the eighth



At the left—100 H. P. Oil Engine driving a generator. Note that the tight side of belt is on top.

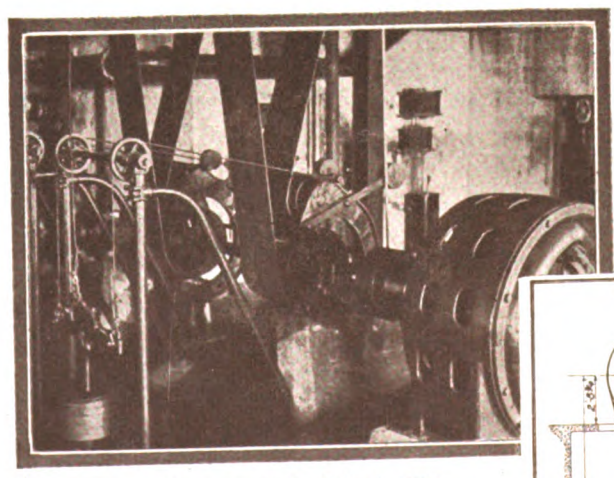


Electric motor, 150 H. P., driving two beaters in a paper mill; horizontal drives.

and one half power (as it theoretically should be, provided the rope was without any stiffness and the coefficient of friction was unity) but just the same, considerably more than the casual observer would think. It is also increased considerably more than required in this particular instance of the old well hoist, but the designer evidently had in mind to keep the two buckets so far apart that they would not come in contact when passing each other in the well.

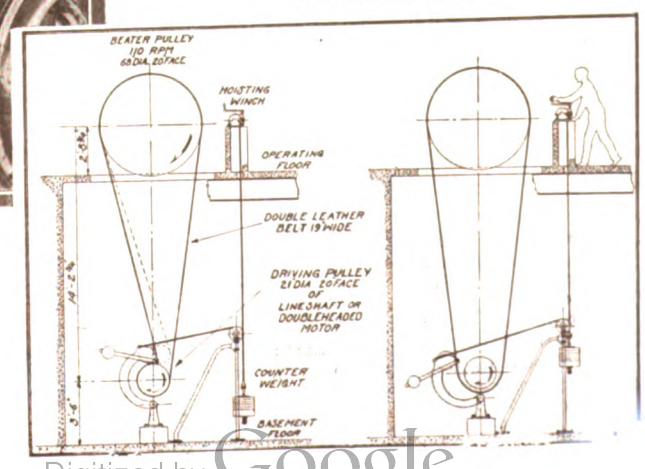
This may appear a long story about nothing, but what has been said has an important bearing on the subject of transmission of power by means of ropes or belts. The evolution of belting practice is merely a more and more scientifically correct utilization of arc of contact, regulation of

(Continued on Page 30)



Driving (by vertical drive) two beaters from a single 150 H. P. motor, in a paper mill.

Showing how the vertically-driven beaters can be controlled individually, though driven by the same motor.



Digitized by Google

Cutting Costs on the Road

How the Hand Lift

BY H. L.



It was in a paper mill that the lift-truck and skid idea was born, some ten years ago. The handling of pulp lap in the manner shown above has revolutionized methods in the paper industry, with consequent savings of thousands of dollars as the system was extended to other departments of the paper mill.

PERHAPS the apple is the first cost-cutting device we know of. To be sure, its economy was decidely a one-sided affair—but an economy it was nevertheless. For when Adam sank his teeth into that luscious Eden Pippin, Eve handed him her millinery bills and grabbed a meal ticket for life. Here was cost cutting par excellence.



Taking "Sun-Maid" Raisins, twenty-five cases at a time, from receiving department to stock or to shipping platform; a quick and easy one-man job.

From the Garden of Eden up, cost cutting has been, directly or indirectly, the concern of all. Sometimes the costs that we would cut seem very obvious. Somebody else's costs most likely—for these are the costs that many times we can trace to our own pocket books.

When milk that is four or five cents a quart on the farm is fourteen or sixteen cents on our doorsteps, we raise an awful cry. "Profiteers! Cutthroats!" We explode. And when coal that is a few dollars a ton at the mine is fourteen to twenty dollars in our coal bins, we are ready to join the I. W. W. or Bolsheviki. But let us calm ourselves for a few moments. Let us serenely and dispassionately analyse these excursions into our bank books —into our inalienable right to peace and happiness.

Why can't we buy milk at four or five cents a quart; coal at a few dollars per ton? Isn't the difference between the costs at farm and mine and those at our doorsteps and bins one that represents the cost that we pay for getting our milk and coal moved "From Here to There?" Coal must be moved from mine to car; on through to retail coal pocket many miles away; must be unloaded and stored; and finally



The Haessler Shock Absorber parts, being kept on box-type platform skids, are easily moved to the assembly department on lift trucks.



Close examination of this stack of filled sacks at the Colonial Warehouse at St. Paul, Minnesota, discloses that it is composed of individual piles on skids; making for ... easy handling in large lots.



Note the hook supports for this storage battery, which enables the lift truck to raise the battery clear of the hooks; making battery-removal a simple job of minutes, instead of a laborious one of an hour or so.

Digitized by Google

"From Here to There"

Truck Boosts Profits

FISHER

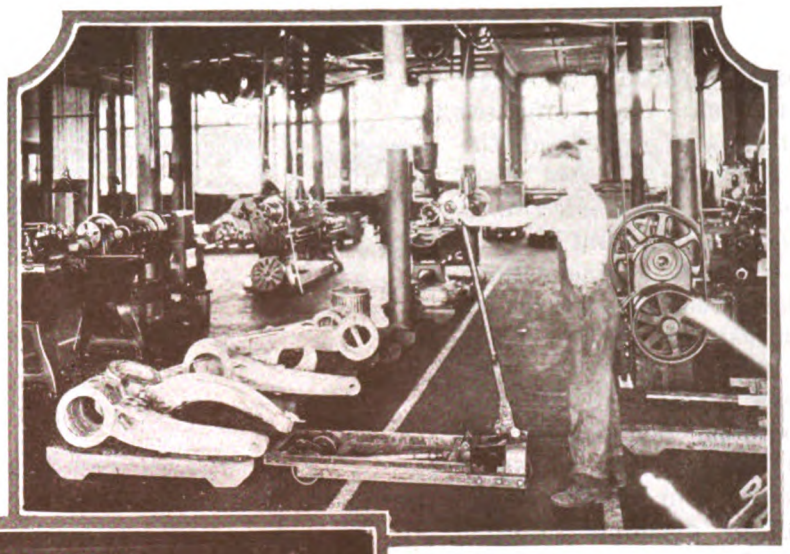
must be trucked to our homes. As we sit down to our morning cup of coffee, but few of us think how far our cream has traveled. We do not picture it enroute from farm to car; or through to railroad terminal at destination; from railroad terminal to Pasteurizing plant; and from plant to our doorsteps. We are paying heavily for that trip "From Here to There."

But there are other handling costs, not so obvious, but equally important. And these are the very material sums spent each day in the shop, the warehouse, the factory, just to move things "From Here to There."

What percentage of manufacturing cost, of selling price, do these costs represent? How much more could be added to profit if these costs were cut in half? Not one manufacturer, warehouseman, or merchant out of a hundred can tell you. Material handling methods in five varied businesses were recently investigated. But not in a single instance was the cost of handling known.

Yet, wide-awake executives are realizing more and more the relation of material handling costs to profits. Every day almost insignificant changes in material handling methods are converting thousands of dollars of waste expense into profit. In a large paper mill 72-inch rolls were recently handled on a 24 hour basis by seven men per shift. Now two paper roll handling trucks and two men per shift do the same work at a saving of over $21,000 per year. A month or so ago, through the addition of a single industrial truck to his handling equipment, a prominent Pennsyl-

(*Continued on Page 42*)

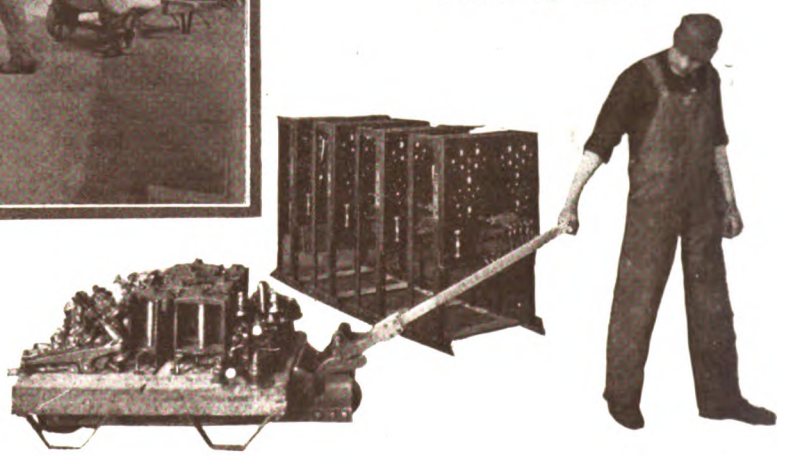


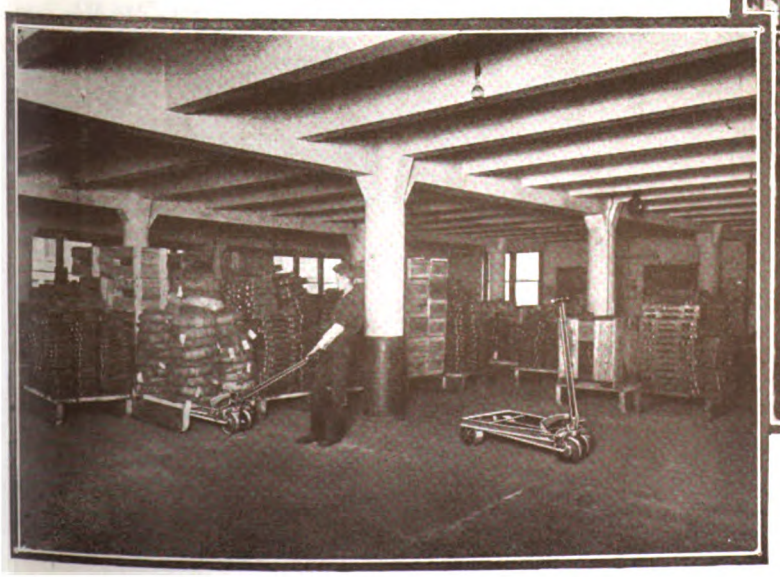
Putting parts in process on skids, instead of on the floor, is just as easy; and it enables these parts to move through the various operations in minimum time and with minimum labor.



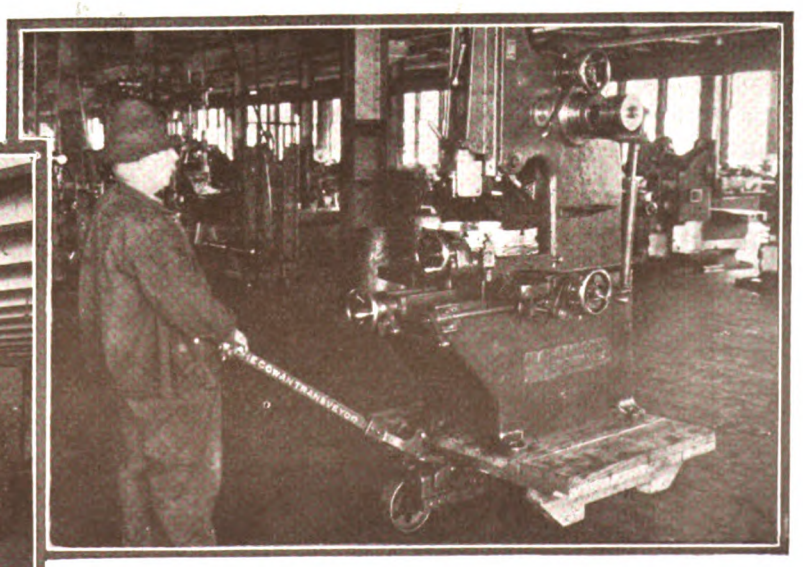
Instead of handling concrete blocks three at a time, the skid and lift-truck method enables a man to handle fifteen at a time; incidentally, there is less breakage by the new method.

Below—Grouping on a skid all the necessary parts for assembly of these electric control panels has speeded up these assemblies to an astonishing degree.





The modern version of a stock room for electrical parts. With motor bases, cable, and so on, piled on skids, these parts can be brought to the various departments as needed, by one man and a lift-truck.



Remember the old way of moving heavy machinery around—with planks and rollers and a gang of sweating huskies? Like the motor-fire-engine, there is much less noise and picturesqueness in the new way, but it "gets there" in a fraction of the former time.

Digitized by Google

Lilliputian Mines and Factories

Fascinating Models in the United States National Museum

By Charles Fitzhugh Talman

THE education "movies" furnish one effective means of gratifying the desire that we all feel from time to time to see *how things are made*. No amount of reading is as good as inspection; and the actual visit to an industrial establishment, besides being a comparatively rare privilege, is often disappointing, because the things one wishes to see are scattered over a large space or are otherwise difficult to examine. Motion pictures, however, suffer under the well-known limitation of not affording an opportunity for leisurely study. Still pictures, well chosen and arranged in logical sequence, are free from this disadvantage; while realistic models are best of all; especially those that "work."

Models illustrating industrial processes are still far from common in our museums. One of the few notable collections in the world is that which has been assembled in recent years in the Division of Mineral Technology of the United States National Museum, in Washington. With the coöperation of many of the leading industrial concerns of the country, the Museum is gradually building up a remarkable group of models, with auxiliary illustrative material, constituting visualized treatises on various branches of mineral technology.

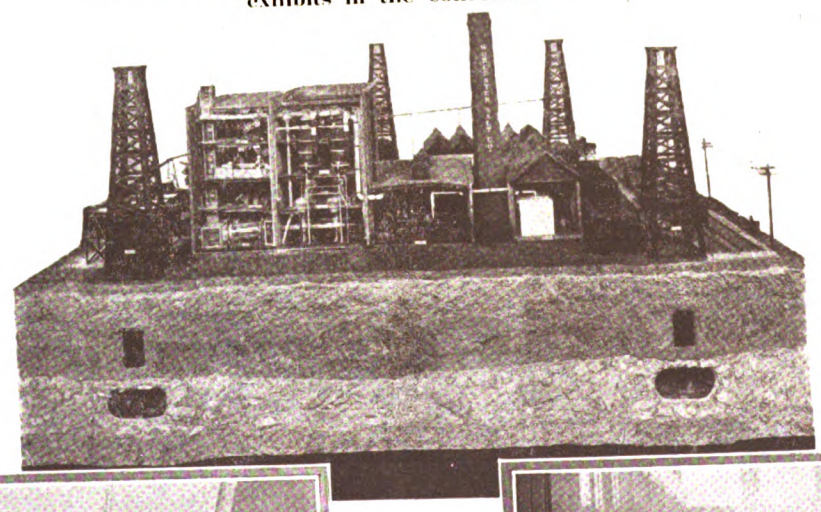


WORKING MODEL OF A BITUMINOUS COAL MINE.

This immense model, covering 1,500 square feet of floor space, shows many important operations in connection with the mining, grading and cleaning of coal and the manufacture of beehive coke. The machinery runs at frequent intervals throughout the day. At the back are windows through which the interior of the mine can be inspected.

SALT WORKS MODEL.

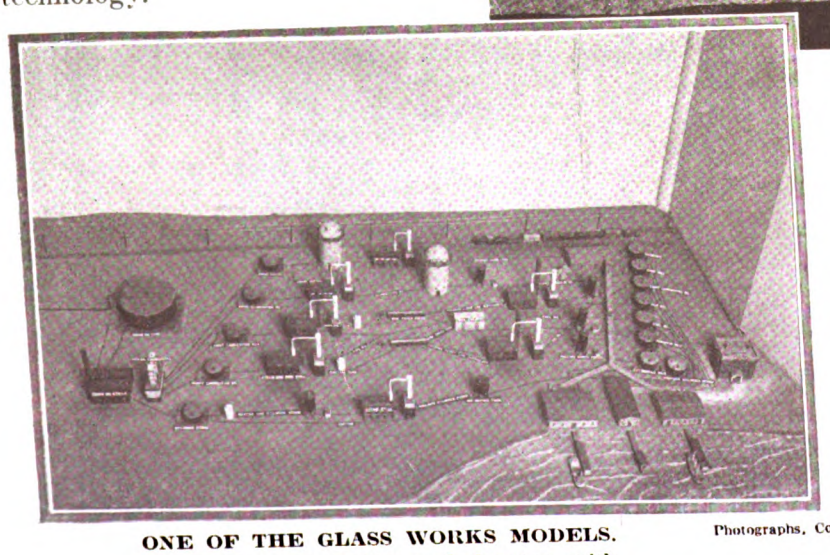
Minia ure workpeople, animated with motion, machinery in full operation, and an abundance of water in circu a ion, make this one of the most fascinating exhibits in the collection.



In the southwest corner of the older of the two Museum buildings (part of the Smithsonian group) you can inspect, in the course of a few minutes, the famous asphalt lake of Trinidad; sulphur wells of Louisiana; gold and copper mines of the West; iron mines of the North; collieries of the East; and factories of many varieties widely scattered over the map. You can see how oil and gas are extracted from the ground and trace their subsequent history. You can observe the ramifications of that hopeful outgrowth of the world war, the American dye industry. To a large extent the models tell their own story, but they are all provided with explanatory labels that supply important facts not patent to the eye.

The biggest model of all, and the one that attracts the largest share of attention, is a wonderfully faithful reproduction of a West Virginia colliery; the gift of a well-known coal company. This is one of the two working models in the exhibition. Every quarter of an hour the hum of its machinery begins and all juvenile visitors within earshot scurry to the spot to watch the mine and the coke plant in operation for an all too brief three minutes. Besides viewing the external features of the colliery,

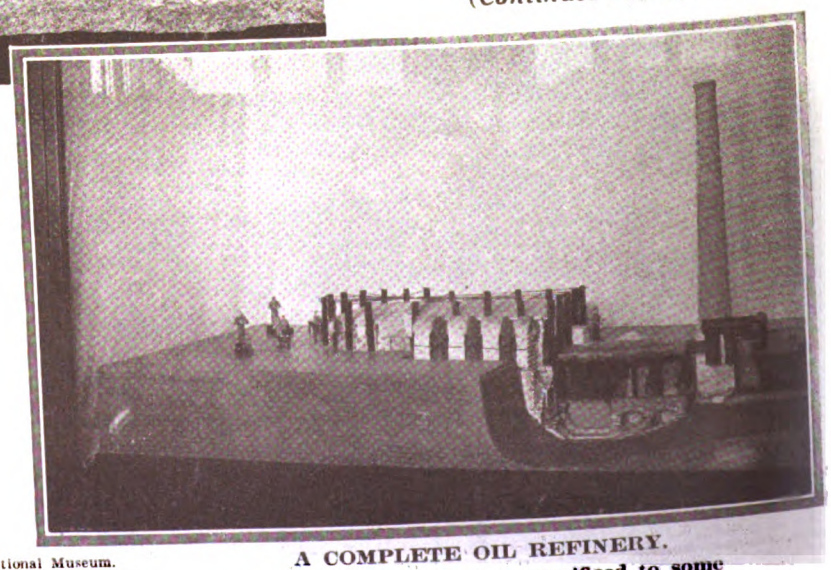
(Continued on Page 58)



ONE OF THE GLASS WORKS MODELS.

Continuous regenerative tank furnace, with workmen blowing glass. Another model shows a pot furnace. A red glow from electric lamps installed inside the model adds a touch of realism.

Photographs, Courtesy U. S. National Museum.



A COMPLETE OIL REFINERY.

In this model realism is sacrificed to some extent in order to show the successive steps by which kerosene, gasoline, lubricating oils, fuel oil, etc., are obtained from petroleum.

Digitized by Google

The "Sport" of Saving Human Lives

By R. T. Barrett.

FOUR men, dressed in white, are carrying a fifth, whose face and limbs are swathed in bandages, upon an improvised stretcher. Slowly, with infinite care, they lower him to the ground.

One of them steps aside, places upon a standard a small pennant-shaped placard bearing the word "Buildings." A timekeeper snaps the button of a stop-watch. Three thousand people, who have been tensely watching every movement of these five men and of six other groups of five men each, burst into cheers. Klaxon horns screech stridently, cowbells take up the din, two giants with sledge hammers beat upon an engine tire suspended from a tripod of two-by-fours, and seven bands blare out seven different march tunes.

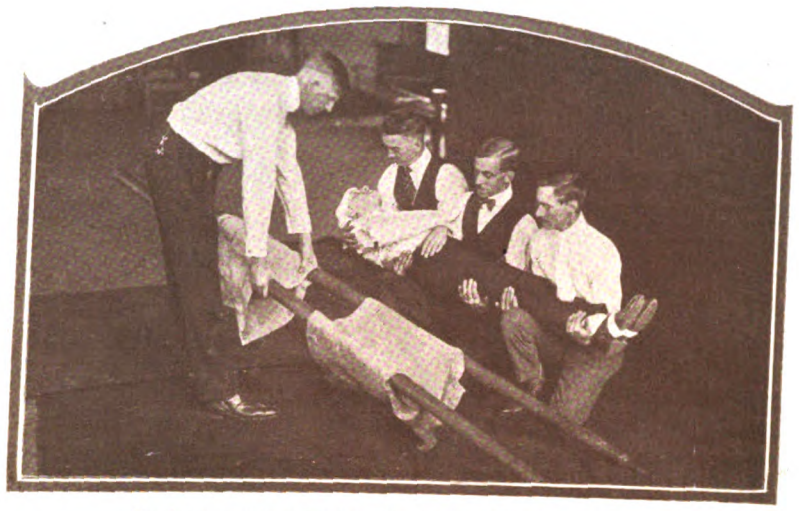
The Sport of Saving Lives has again "proved in." The Fourth Annual First Aid Contest of the Pittsburgh Division of the Bell Telephone Company of Pennsylvania has become history. And, after being judged by leading physicians of Pittsburgh and by fellow employees, who know the fine points of First Aid work even better than most of their professional associates and who are far more exacting critics, the winning team has chalked up a score that is within two points of possible perfection.

But to begin at the beginning: These seven First Aid teams which met at Motor Square Garden, Pittsburgh, on the night of April 26th, 1922, had won high honors in being there at all. They had been selected in elimination contests in which 126 teams had taken part. In preparing for these contests 1,732 First Aid meetings and practices had been held, with a total attendance of 15,897. Every one of the 1,125 men in the plant department had enrolled and taken the full course in First Aid training. And all of the work was done on the employees' own time.

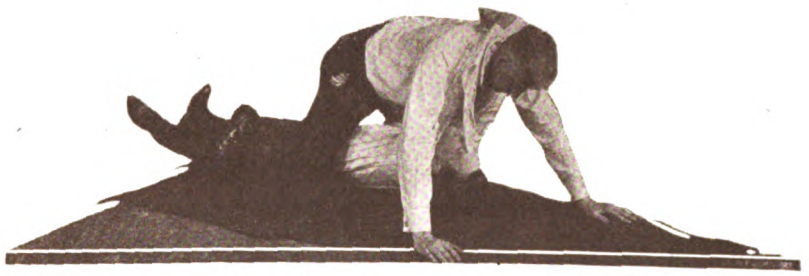
Each team consists of a "patient" and four other men, one of whom acts as captain. The contest is based upon proficiency and promptness in the application of First Aid treatment to a supposititious case of injury, the problem being read by the chief judge two minutes before the bell sounds for the contestants to begin work upon the "patient." In addition to the reading of the problem, a type written copy is delivered to the captain of each team and during the two-minute interval allowed, the members of the team gather around him, carefully study the nature of the hypothetical injuries and apportion the work of treatment among them.

Even in the statement of the problems an effort is made toward realism, with the result that instead of merely apply-

(Continued on Page 60)



Patient resting on the knees of three bearers, fourth bearer placing stretcher in position.



Removing patient from a location where it is impossible for bearer to assume an erect position.

(Below)—Making an improvised stretcher (Pike poles and coats)





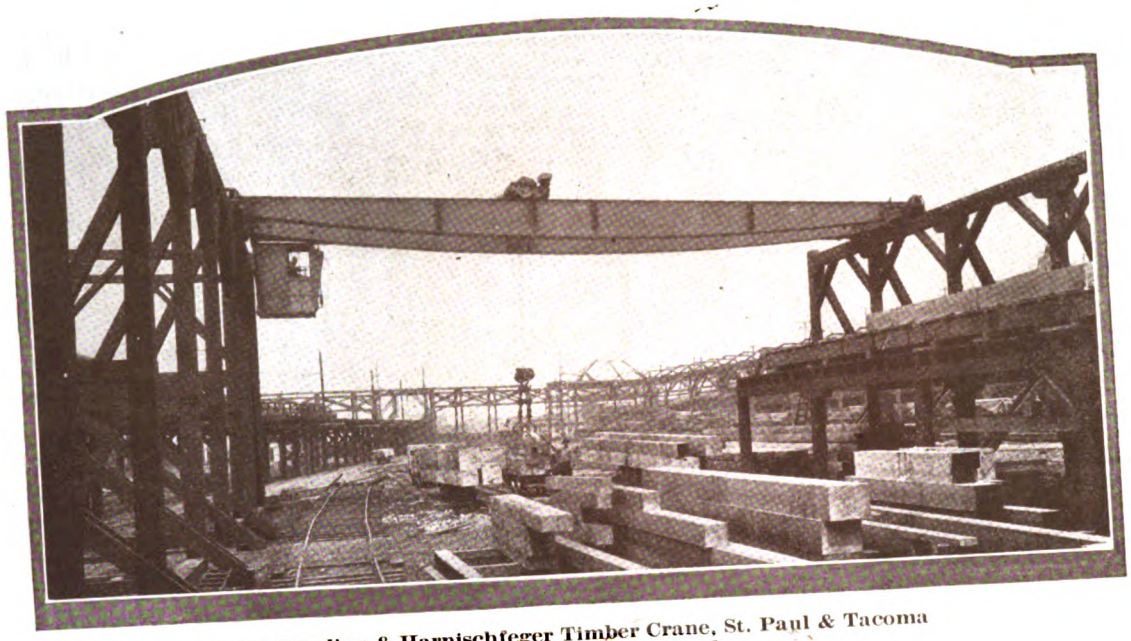
Treatment for compound fracture of left thigh and burn on right hand.



Treatment for electrical burn on shoulder and artificial respiration.

Digitized by Google

The Overhead Trolley in Lumber Production

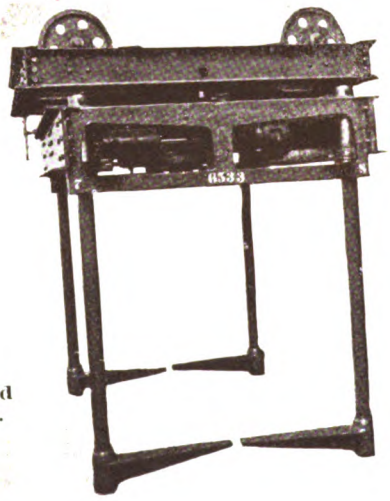


5-ton Pawling & Harnischfeger Timber Crane, St. Paul & Tacoma Lumber Co., Tacoma, Wash.

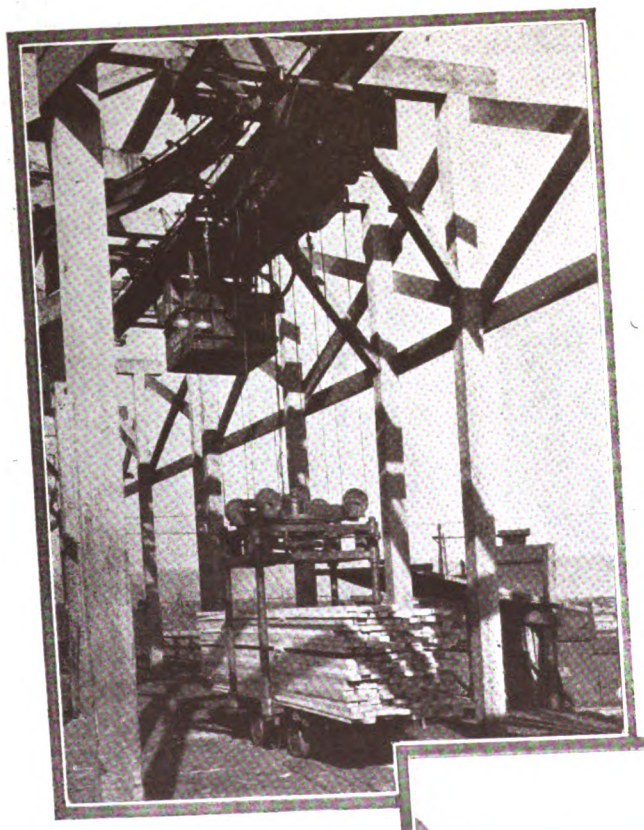
THERE is no phase in manufacturing in which greater savings are possible than in the handling of materials. For this reason manufacturers have given material handling problems serious consideration in the past twenty years, with the result that today there are hundreds of different machines for handling and conveying materials of every sort, which have proven effective in cutting down production costs.

There is one basic industry which has been somewhat slower than the others in the general adoption of modern handling methods and that is the lumber manufacturing industry. The reason for this is not difficult to find. Generally speaking, lumber is well adapted to hand handling methods. One or two men can handle most dimension stock and the transportation can be taken care of by means of dolly, truck or tram. A second good reason why lumber handling equipment has not been more universally adopted is the fact that there are so many different sizes to be handled even in the same mill, that many mill men have believed it impossible to handle lumber advantageously except piece by piece.

There is one system that has



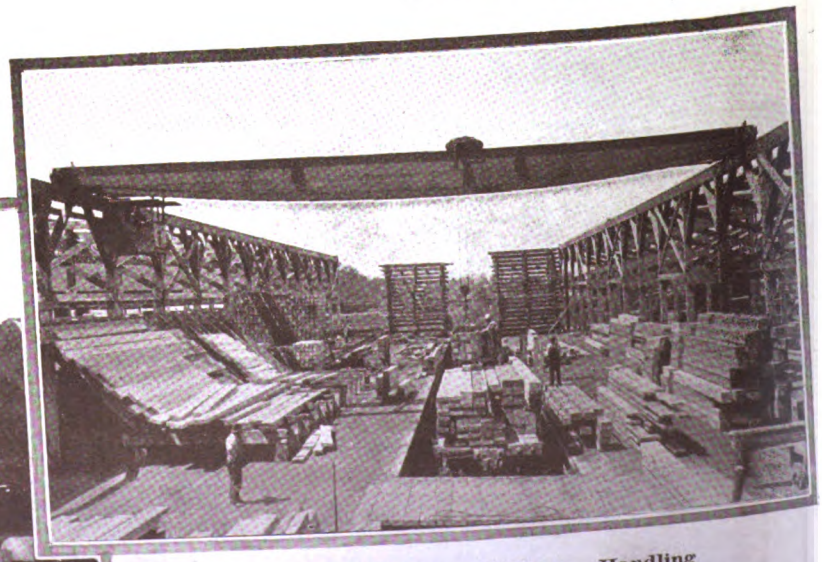
Motor - Operated Lumber Grapple.



5-ton Lumber Hoist with Motor-Operated Grapple, carrying lumber from green sorter and depositing on trams for distribution. St. Paul & Tacoma Lumber Co., Tacoma, Wash.



10-ton Lumber Handling Crane. This crane has handled 600,000 board feet of Lumber in 10 hours, Weyerhaeuser Timber Co., Everett, Wash.



3-ton Double-Hook Timber Handling Crane-Booth-Kelly Lumber Co., Springfield, Ore.

Digitized by Google



5-ton Lumber Hoist carrying lumber away from dry sorter, St. Paul & Tacoma Lumber Co., Tacoma, Wash.



5-ton Lumber Hoist with Hand Operated Grapple, Lutcher & Moore Lumber Co., Orange, Texas.



10-ton Lumber Handling Crane Serving Warehouse, Thompson Yards, Inc., Minneapolis, Minn.

appealed to practical lumbermen as an efficient method of handling and which has been more widely adopted, perhaps, than any other. This system is simply an application of the old principle that it is more economical to do work on a large scale than on a small one. Following along these lines lumber is handled in unit packages containing from 2,000 to 5,000 board feet, in place of a single board at a time.

The carrier itself consists of two hoisting drums suspended from trucks which run along a monorail beam. Suspended at 4 points from the two hoisting

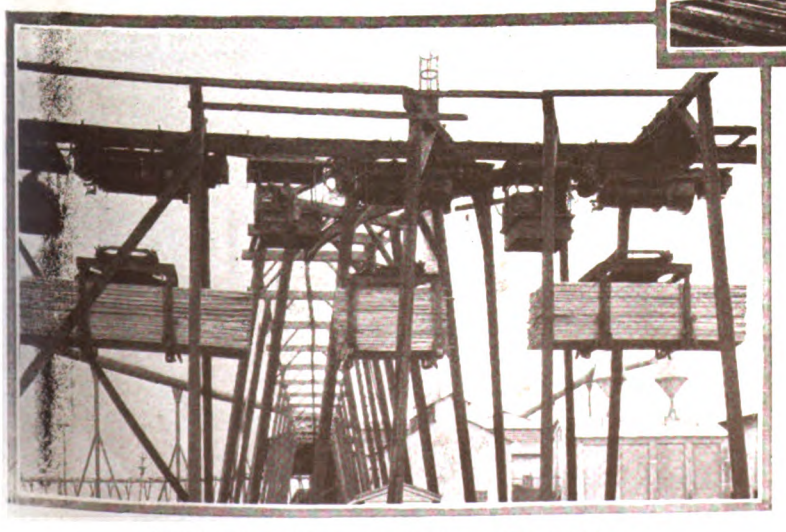
Showing Lumber Unit Storage Under Monorail Track, Hammond Lumber Co., Astoria, Ore.



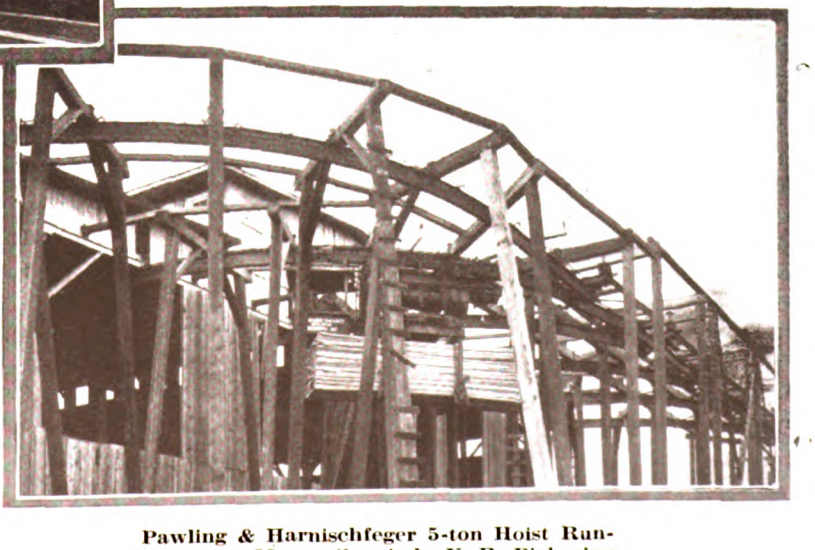
mechanisms by means of eight cables is a cradle or grapple which contains the unit of lumber. This grapple is provided with suitable hooks for grasping skids upon which the units of lumber rest. The hooks are operated by a small cable from the operator's cab, regardless of the position of the load. The cradle is suspended from a ball bearing turn table so that the unit can be turned either parallel or at right angles to the monorail track.

This grapple is also built so that it is operated by electric motors controlled from the

(Continued on Page 67)



Three 5-ton Monorail Hoists, each carrying a different sized unit, U. R. Pickering Lumber Co., Halsam, Texas.



Pawling & Harnischfeger 5-ton Hoist Running onto Monorail switch, U. R. Pickering Lumber Co., Haslam, Texas.

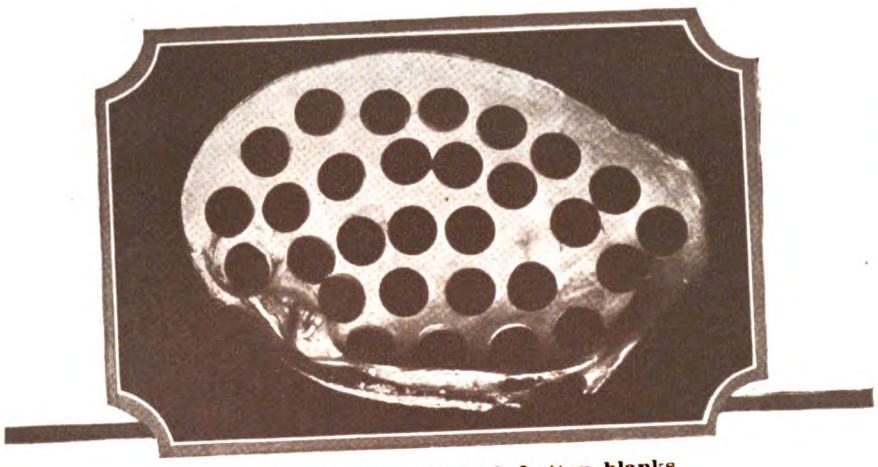
Digitized by Google

How Machinery Gets $15,000,000 a Year from Clam Shells

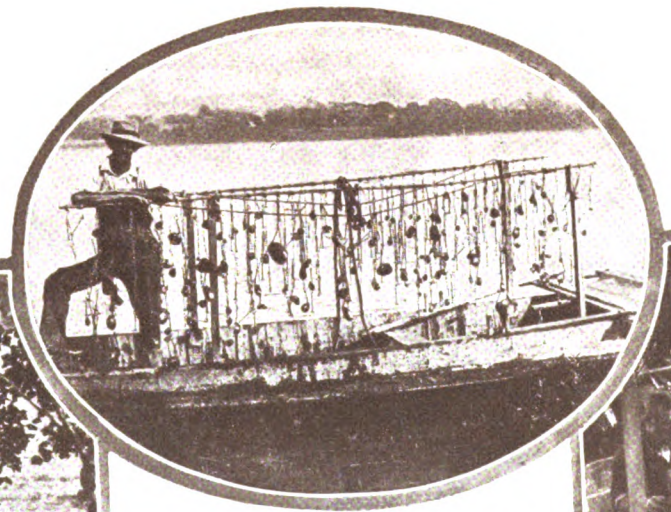
By Robert H. Moulton

THE supply of button-holes in this country will never exceed the supply of buttons if Uncle Sam can prevent it. The government has never taken a census of button-holes in the United States, but Federal enumerators in the last census discovered that the value of all buttons produced in this country in a single year is more than $50,000,000. This represents several billions of buttons.

The fresh-water mussel, the lowly clam of the old swimming hole, is the largest single source of buttons in this country. Something like 75,000 tons of clam shells are used annually in the manufacture of more than 50,000,000 gross of pearl buttons which at present prices are valued at more than $15,000,000. In addition to buttons, the mussel shells are also used in the manufacture of novelties, jewelry, chicken feed, road materails, composition marble, and otherwise.



A mussel shell from which button blanks have been cut out. These blanks are cut from the shell by means of tubular saws in a lathe. They vary in thickness, according to the part of the shell from which they are cut, and must later be sorted according to thickness.



"Bar and Crowfoot" outfit for gathering the raw material for buttons.

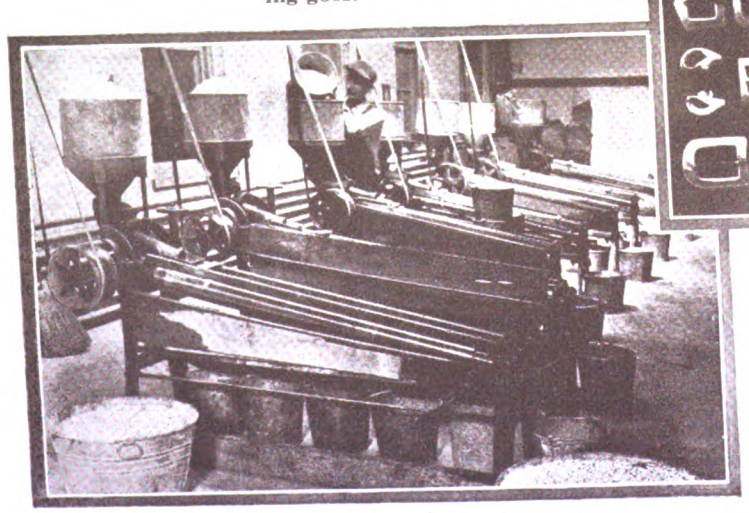
Below—some of the infinite variety of products made from mussel shell.



Cooking out the mussels, which are merely waste, as far as button-making goes.



Cutting out blanks by means of tubular saws revolving at high speed.



These machines automaticaly sort the blanks according to thickness.



Tumbling barrels, in which the buttons receive their final polish.

Several years ago the Bureau of Fisheries discovered that the great clam beds which are the source of the best buttons were being rapidly exhausted. Investigation showed that nature in her propagation and growth of pearl button material wast wasteful. It was also found that natural propagation of mussels could be improved and controlled artificially and means were taken to restock the clam beds. In this scheme fish are a necessary adjunct.

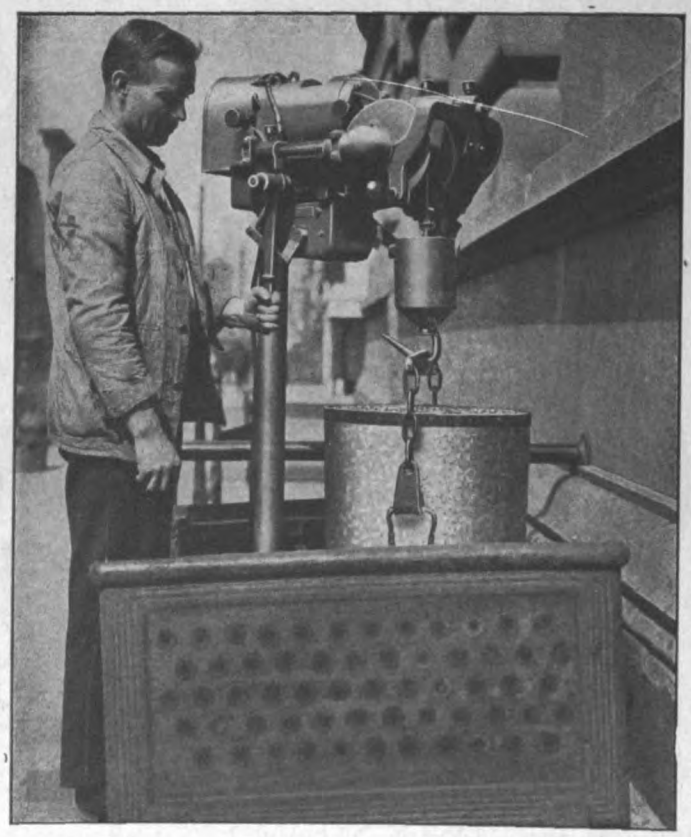
When fresh-water clams have just started their development they must become parasitic upon fish if they are to reach maturity. Almost as soon as they are hatched the baby clams attach themselves to the gills of fish. In this position they cling to the fish and if all goes well, during the

(Continued on Page 72)

Digitized by Google

15½ Tons of Ashes in One K.W.H. With

The G & G ELECTRIC REG. U.S. PAT. OFF. Telescopic Hoist
With Automatic Stop and Gravity Lowering Device

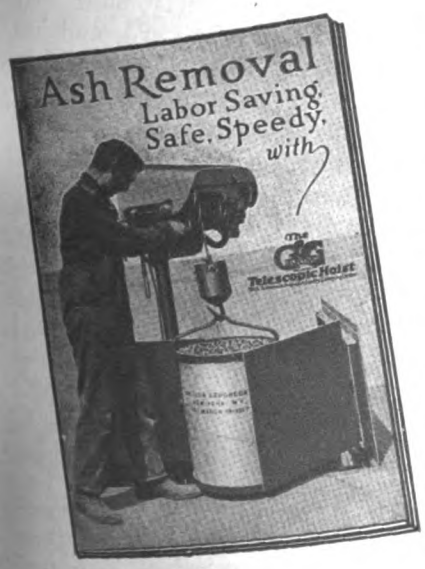


How much does it cost YOU to remove ashes?

THE G & G Model E Electric Telescopic Hoist in use at the main Long Island building of the New York Telephone Company was subjected to an official test to determine the cost of power consumption. Engineers of the Sprague Electric Works of the General Electric Company conducted this test for us. Cans containing 105 pounds of ashes were raised at the rate of 296 cans in one k.w.h., or at the rate of 15.54 tons of ashes. The height of lift is 16 feet 8 inches.

The cost of current at this installation is .0348 per k.w.h. Therefore 85 cans of ashes are raised for the remarkably small cost of 1c.

This test, we believe, establishes a new record for economical ash removal.



The Bell Telephone System has found G & G ash removal equipment so satisfactory that they have installed it in 81 of their buildings. At the Cortlandt Street New York building two other ash removal equipments had been installed and removed before a G & G was adopted. After a year and a half of use the Chief Engineer said that in spite of unusual and difficult conditions G & G ash removal equipment is the *only* satisfactory equipment they have had.

While the distances of lift, and cost of current per k.w.h. varies in practically every instance, the above test is a fair index to the economical use of current by all G & G Electric Hoists.

Industrial plants, factories and shops have found many other uses for G & G Hoists in addition to that of ash removal. These Hoists are made in telescopic and non-telescopic models, for hand and electric power, and are qualified to give entire satisfaction in the handling of all industrial loads up to 1000 pounds.

If you will tell us something about your own hoisting problem, whether it involves handling of ashes, or boxes, bales, barrels and other light factory loads, we will be glad to make definite recommendations as to what type of Hoist is best suited to your needs.

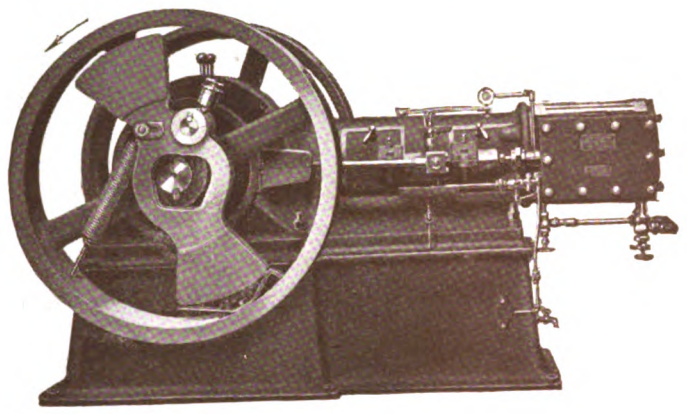
Write for new booklet No 190 which tells the story of G & G Electric Hoist in connection with ash removal. If you are interested in handling other loads too, write for booklet No. 140 "Industrial Plants need this Hoist." These booklets may be the means of saving you considerable time, labor and money.

GILLIS & GEOGHEGAN 556 West Broadway New York City

Digitized by Google

TROY ENGINES

ONLY STEAM ENGINES — GOOD ENGINES ONLY

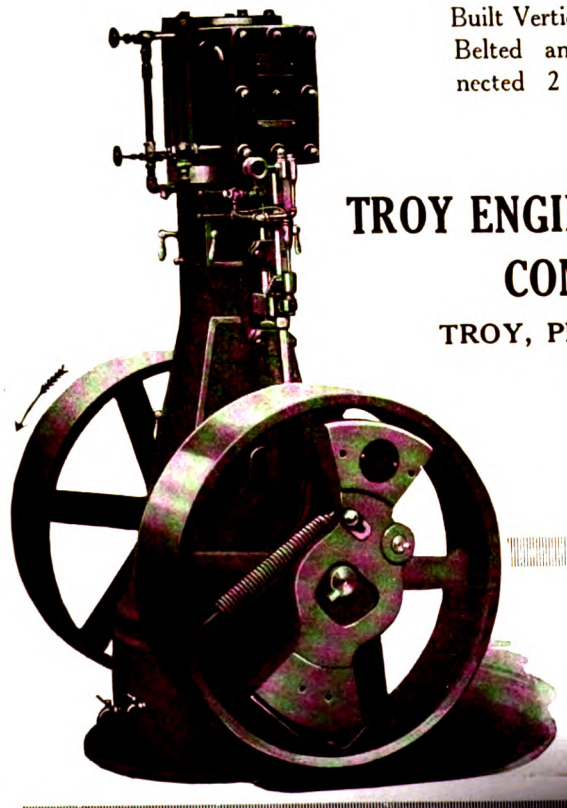


ADHERENCE to our slogan originated over 31 years ago, "ONLY STEAM ENGINES—GOOD ENGINES ONLY" has developed a product known as the best Small Engine made.

The exclusive oiling system, which supplies an abundance of oil to all bearings and wearing parts—the rugged design—the attractive appearance—the special balanced valve—these and other features give the reason for its absolute reliability and efficiency.

TROY ENGINES Deliver Greater Brake Horse Power with the Same Steam Consumption.

It will pay you to investigate why thousands of TROY ENGINES are in use for driving stokers, fans, blowers and other boiler room equipment.



Built Vertical, Horizontal, Belted and Direct-Connected 2 to 200 B.H.P.

TROY ENGINE & MACHINE COMPANY

TROY, PENNSYLVANIA

Send for descriptive literature

From Inventor-Manufacturer to Scientist

(*Continued from page 17*)

little faster, and got sixty-five lights out of the same dynamo, an increased output of sixty per cent!

He made search lights practically useful by devising a regulator for keeping the arc in the focus. His portable electric light plant, as distinguished from the fixed central station, made the lighting of ships so feasible, so safe and so economical that, especially in England, ship lighting made greater strides than the lighting of city streets and buildings.

In 1881 he perfected the storage battery—in those days it was more often called a secondary battery or accumulator. The steadiness of current required by incandescent lamps could be attained only by storage batteries. But within four years Brush had a plant at Cheyenne, Wyoming, where a circuit of 150 incandescents received current directly from an improved Brush dynamo up to midnight, and were then switched on to the storage batteries for the rest of the night. As an inventor, he does things.

And as a captain of industry, he does things. No "down trodden inventor" there! We think the twentieth century developments of the automobile, airplane and radio as business enterprises have beaten speed records. But Business Man Brush traveled just as fast in the first years of the last quarter of the nineteenth century. Inventor Brush produced the arc light in 1876. He founded the Brush Electric Company on that invention, and spread over the country so rapidly that in four years he crossed the Atlantic Ocean and acquired a small English corporation which he converted into the Anglo-American Brush Electric Company with a capital of $800,000. In two years more there were fourteen subsidiary Brush companies in Great Britain with a paid-up capital of $1,003,475.

In the United States, within nine years of the time he perfected the basic invention, there were over 100 Brush companies lighting the streets of as many cities with over thirty thousand 2,000-candle power arc lamps. The New York City company had 1,800 street lamps, some of them bunched on high towers. A newspaper writer declared that people raised their umbrellas or parasols when they passed through Madison Square, which had one of these "light masts." Trenton and about one hundred other towns had companies which furnished 150 street lights or less.

And these companies had a fixed habit of paying dividends. The Brush scheme of organization was practical and profitable. The lighting companies were licensed to use the Brush devices, while the parent company retained the manufacturing rights. Did we say, a while back, that business is the art of finding users of manufactured products? It is a refinement on that art when you *create* your users! Brush did it all over the world. By 1885 there were companies operating throughout the United Kingdom, continental Europe, India, China, Japan, Mexico, Central and South America. The British Navy carried Brush lights to any stray port of the world that happened not to have any of its own on land.

Mr. Brush retired from active connection with these corporations when he reached the age of fifty, built a laboratory in his yard, and has enjoyed himself ever since in such pastimes as extracting oxygen from the atmosphere and accumulating memberships and medals conferred by scientific societies of the world. About 1907 he organized the Linde Air Products Co., which has since grown to enormous proportions. He seems to have a Euclid complex in his make-up. He was born in Euclid township, near Cleveland, Ohio, in 1849, and when he was able to build a home, he built it on Euclid Avenue, Cleveland, where he still lives. There the writer, in his small boyhood days, used to knock "buck-eyes" off the trees on the great front lawn until the gardener chased him away.

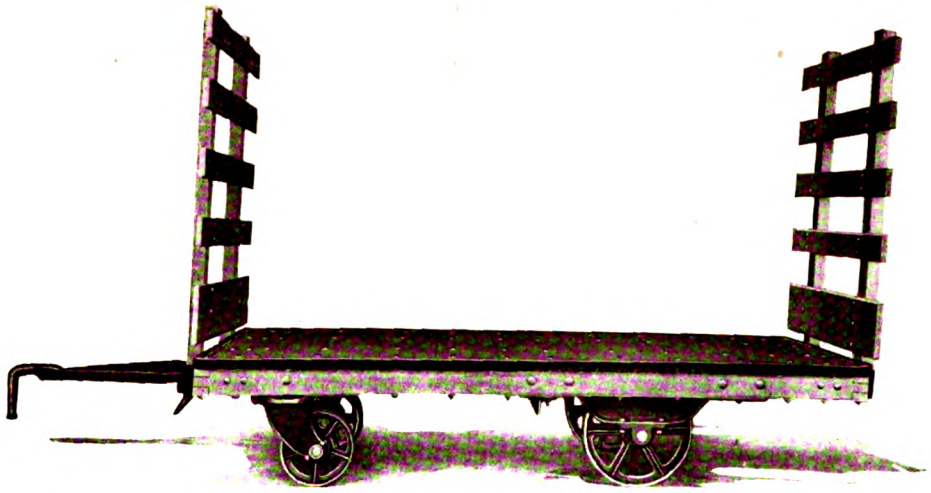
Digitized by Google

As Necessary as Railroad Facilities



The K&J Industrial Trailer Train

Just ordinary economy and competitive foresight, today, is demanding "K&J" Trailer Trains with tractor.



There are now approximately 15,000 trailer-tractor units in use. Installations are increasing at the rate of about 3,000 per year.

You cannot long afford to be out of step with progress in your facilities for handling materials. Comparative cost figures, as reflected in market prices probably are warning you now.

Bear in mind, also, that proper trailer designs are as necessary to your economical operation of trailer trains as proper rolling stock designs are necessary to economical railway operations. "K&J" Trailers are of specialized *trailer* design, providing for the handling of tonnages, instead of hundredweights, on small units—providing against all the contingencies of the power haulage of non-rail equipment—for the steering flexibility under load necessary to the wide range of such operation. They will give you cheaper, longer, uninterrupted service.

Standard designs are made in 2, 4 and 6 tons capacity. Special designs of all types are furnished.

Hyatt Roller Bearings are standard equipment on all "K&J" Standard Trailers.

TRADE MARK
THE SEAL OF SATISFACTION K&J REG.

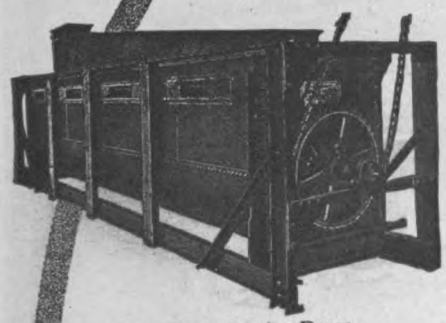
Get Bulletin No. 510.

The Kilbourne & Jacobs M'f'g Co., Columbus, Ohio, U. S. A.

New York Offices, 120 Broadway

Digitized by Google

Solving Your Drying Problem



This Brecht-Lewis Dryer turns out greater volume—faster, better and cheaper.

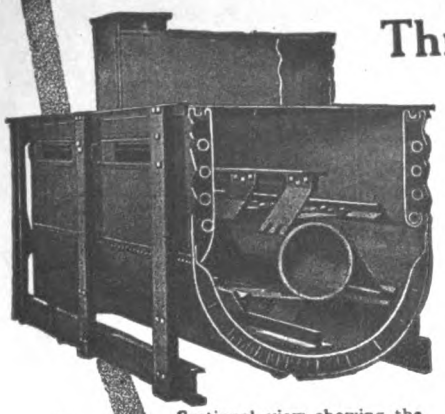
MANY drying problems vanish with the installation of a Brecht-Lewis Dryer. Greater volume, more perfectly dried product, and with lower steam consumption and H.P. used—that is the remarkable accomplishment of this new departure in dryers which can be operated either as a batch or continuous dryer at a saving over other systems.

BRECHT-LEWIS DRYER

(PATENTED)

The Brecht-Lewis Dryer opens a new era of economy in the drying of all materials of a loose, shredded or granular nature. Successfully handles:—

Apple Pomace
Alfalfa Meal
Beet Pulp
Bagasse
Bone
Carbonates of Lime, Potash or Soda
Cereal Products
Chalk
Charcoal
Clays
Coal
Coffee
Copra
Cork Chips
Cotton Seed Meal
Fish Scrap
Garbage
Grains
Graphite
Gravel
Gypsum
Kaolin
Leather Scrap
Lime
Marl
Metal Chips
Nitrate of Ammonia
Nitrate of Potash
Packing House Products
Peanut Hulls
Peat
Phosphate
Pumice Stone
Rice
Salt
Sand
Sawdust
Silica
Soapstone
Sugar Refuse
Talc Rock
Tobacco Stems
Whiting, and many other materials



Sectional view showing the improved method of heating and agitating—the secret of this dryer's efficiency.

Three Dryers In One!

This new design is really three Dryers in one; a combination of direct and indirect heat dryer allowing heat control from three sources—

1. From the steam drum,
2. From the jacketed bottom,
3. Hot air forced in from the side coils,

and is therefore adaptable to materials requiring either high or very low temperatures.

Hot air under pressure carries away the released moisture without recondensation.

Write for FACTS!

THE BRECHT COMPANY
1219 Cass Ave. St. Louis, Mo.

Branches:

New York, N. Y.
Chicago, Ill.
San Francisco, Cal.
Liverpool, Eng.
London, Eng.
Cape Town, S. A.
Buenos Aires, A. R.
Madrid, Spain
Shanghai, China
Mexico City, Mex
Sidney, N. S. W.

The Brecht Company,
1219 Cass Ave., St. Louis, Mo.

Please tell me, without obligation on my part, how the Brecht-Lewis Dryer is adapted to my business, and how it will effect economies for me.

Quantity of material to be dried daily .....

Percentage of moisture in mixture .....

Percentage of moisture to be removed .....

Firm Name ..... Address .....

Attention of ..... Title .....

Evolution in Belting Practice

(*Continued from page 19*)

initial tension and improvement in the coefficient of friction between belt and pulleys, as evidenced by the use of pulleys with a facing of paper, wood, canvas, fibre, cork or leather. Improvements in the coefficient of friction, while of interest, will be considered outside the scope of this article. The same applies to the use of belts of thin steel which must still be considered in an experimental stage of development.

If any should think that what has been said about power transmitted by means of ropes has very little to do with power transmitted by means of belts, it may be sufficient to point out that a fabric belt consists of a multitude of fabric ropes, interwoven or otherwise interconnected by means of rubber, balata or other gumming substances. On the other hand, whereas leather belts are mostly used as flat, narrow or wide bands, round belts, the equivalent of ropes, are frequently used for small pulleys.

The frictional contact surface between a round belt and the driving or driven pulley is very small. This is partly overcome by the use of "U" grooves in the pulleys, or, better still, by "V" grooves. Round belts are used mostly for the transmission of fractional horsepowers, such as on sewing machines, etc. On the other hand, for the transmission of large horsepowers, heavy one-inch to two-inch diameter ropes of cotton or hemp are used in multiples; particularly, some years ago, they were used to a great extent for the transmission of power from large reciprocating engines to a series of line-shafts. Such installations are still quite common in the older cotton, woolen and silk mills. However, the speed ratio of rope drives is rather limited because of the natural stiffness of heavy one-inch and two-inch ropes.

Common for both rope and belt drives is the fact that they are *elastic and flexible drives* as compared with metallic chain or gear drives which are *positive drives;* that is, the speed ratio between the driving and driven shaft is fixed and any sudden shock or variation in the power transmitted is delivered with undiminished force to the power of breakage of the gear or rupture of the chain. Whereas positive drives are absolutely essential where the speed ratio between the driving and driven shafts must be fixed, as in the case of the half speed valve-operating cam shafts of automobile engines, elastic and flexible drives are more or less desirable for most industries.

The reason for this requirement is quite evident both as a safety device and especially when it is remembered that the transmission of power, as a rule, is either from a unit of uniform speed—for instance, an electric motor—to a unit with a periodically fluctuating speed, such as a compressor, punching press, etc.; or from a single-cylinder gas or steam engine to a generator. In such instances, heavy flywheels are resorted to in order to minimize the fluctuations in the power to be transmitted.

In the "good old days" when leather was cheap and real estate and floor space a fraction of what they are today, a liberally proportioned belt drive was soon found to be the ideal and simplest means of power transmission.

To define historically what is to be understood by the "good old days" may be a little outside of the scope of this article. The evolution of the belt and rope drive is naturally closely connected with the invention of the steam engine, and, previous to that, the water wheel and the horsegin, etc. However, it might be proper to state that the art of making special leather belts for power transmission purposes, as a regular industry, is of comparatively recent date, about the beginning of the nineteenth century. It must not be overlooked that James Watt invented the double acting steam engine toward the end of the eighteenth century. In the middle of the nineteenth century, heavy rope drives became quite popular for the transmission of large horsepowers. There was really no limit to the capacity of

(*Continued on page 32*)

Digitized by Google

Hays Man Saves $540.00 Every Month in Fuel Cost

K. R. Williams, of Charleroi, Pa., cuts coal consumption from 15 to 9.2 tons a day. Engineer Shoemaker, another Hays man, cuts 213 tons to 100 tons a month with an even bigger load. Everywhere Hays students are using their practical knowledge of combustion and fuel saving to make amazing cuts in coal bills. My book on Combustion, sent free, will show you the way to similar savings in your plant.

THE question which all power plants are facing this winter is not so much the price of coal as it is "Will we be able to get enough fuel to keep our plant in operation?" Saving fuel becomes more vital than at any other time in the history of our country.

Run through the advertisements in this magazine and you will find countless mechanical devices for increasing fuel efficiency and cutting costs. But remember, that the boiler-room never can function automatically. Before these mechanical stokers, draft gauges, blower regulators, gas analyzers, etc., can be of practical use there must be the human brain of a directing genius who has a fundamental and thorough knowledge of every phase of combustion. It is this human mind which must put into effect the short cuts to fuel saving and higher efficiency. Not only must he know how to correct and eliminate every condition causing waste, but he must be able to command the respect of the men under him and inspire them to the hearty cooperation that is essential before any plant can get the maxium of power from every lump of coal. Every modern plant should have a Combustion Engineer.

Heretofore, the four years of technical training necessary has made Combustion Engineers very hard to find. But now the Hays School of Combustion is prepared to make any man in your plant a Combustion Engineer, an expert in fuel economy without taking a minute from his job. The training is given in his spare time at home. And the results in every case have been amazing.

The records shown in the panel on this page are only a few of the hundreds which we have in our files. But these are not remarkable when you consider the records of the men who prepared this course. Those whose experience is combined in this training are: Jos. W. Hays, well known writer and consulting engineer; Prof. S. W. Parr, of the University of Illinois,—authority on fuel chemistry; Fred R. Low, Editor of "Power;" David Moffat Myers, prominent consulting engineer and formerly of the Fuel Adminstration; Arthur L. Rice, Editor of "Power Plant Engineering"; W. L. Abbott, Commonwealth Edison Co., Chicago; I. E. Moultrop, Edison Elec. Illum. Co., Boston; and Jos. Harrington, stoker expert.

Savings Quickly Noted

"Already I have made a saving recognized by more remuneration." F. E. Burgess, of Philadelphia.

Fuel Efficiency Wins Recognition

"Have had two raises as a result of the savings I have effected since taking the Hays Course." Gordon Kelly, Cambridge, Mass.

$200.00 Saved Here

"In the last two months I have saved $200.00. At least 50% of this was in coal saved." William Weston, another student.

Cut Coal Bill 15%

"I have cut our coal bill 15%." Edw. C. Grove.

Saved 60 Tons In One Month

"Saved 60 tons of coal this September compared with same month last year." George W. Austin, Tuskegee, Ala.

Reduced Consumption 10%

"Have reduced fuel consumption 10%." L. B, Quam, of the Oil Belt Power Company.

Think over now the men in your plant. Which one is the most apt? Which one would you like to have me train to save fuel for you? Either pass this advertisement on to him with the suggestion that he investigate this course, or call him into your office and ask him if he is interested in becoming an expert in his work. Or, better still, investigate this course yourself before mentioning it to your man.

FREE *WHEN SHALL WE MAIL YOUR COPY OF THIS COST CUTTING BOOK?*

Any Man Can Learn How

The course in Combustion and Fuel Efficiency is so interesting, so clearly written that any man of ordinary intelligence—with no better than a common school education—can master it and become as good and as expert a Combustion engineer as though he had spent four years at a technical school. From the very first lesson he learns principles and what is more important, how to apply them at once in his daily work. This is true throughout the course.

Send Coupon Now

But what you are interested in is "How much fuel can I save?" Space forbids details. We have prepared a book which will give you the whole story, tell you all about the course and about the various plans now in use in America's leading plants for training the men to stop the hundreds of little leaks that waste coal. Paste the request printed below to your letterhead and mail it at once. The book will be sent free without cost or obligation.

HAYS SCHOOL OF COMBUSTION
1412-14 S. Michigan Ave. Chicago, Ill.

Hays School of Combustion, Dept. 78
1412-14 S. Michigan Ave.,
Chicago, Illinois.

Send me your Book on Combustion without obligation

Name .....

Address .....

City ..... State .....

Company ..... Position .....

Digitized by Google



Your Problems SOLVED With Facts

With your records placed on ACME VISIBLE EQUIPMENT every fact becomes instantly accessible—visualized.

Your eye is directed to conditions needing attention. When applied to your important records ACME VISIBLE EQUIPMENT will—

—Reduce Inventory
—Lower Operating Cost
—Limit Employee Turnover
—Speed Time and Cost Work
—Decrease Overhead Expense

In connection with every active record ACME EQUIPMENT instantly multiplies its value—gives more positive control.

The coupon with samples of your present cards or sheets attached, will enable our Service Department to outline in detail what ACME EQUIPMENT will accomplish for you.

ACME
CARD SYSTEM COMPANY
4 No. Michigan Avenue, Chicago

ACME CARD SYSTEM CO., Chicago, Ill. 1122II
Send catalogue and outline how Acme will benefit my work.

Kind of record *No. of cards*

Name
Address
By

(*Continued from page 30*)

rope drives. All that was required was to add sufficient ropes to carry the load and no special machinery had to be invented to make ropes. It was quite different with the manufacture of large, wide leather belts, say three-ply and 84″ wide. Large hydraulic presses and carefully selected, tanned and impregnated hides were required. All these difficulties were gradually overcome, however, and the leather belt was recognized as the ideal means of power transmission. Some of these original belt drives have been in use forty years and are still giving satisfaction. As a strong competitor to the leather belt must be mentioned the various brands of fabric belts which in many cases have proved an excellent substitute for the leather belt, particularly where the long life of the leather belting is of minor importance and the high cost of leather becomes a deciding factor. So much for the history of the manufacture of leather and fabric belts.

A comparison of the merits of the three elastic means of power transmission, the power transmission rope, the leather belt and the fabric belt will not be attempted here. Instead, we will go back to the well hoist of the sixteenth century and the old fashioned, liberally proportioned belt drive of the latter part of the nineteenth century. The arc of contact of belt drives of this period was usually very close to 180° because the center distance was liberal and the pulley or speed ratio small. Very often it was a Corliss engine of 75 RPM driving a lineshaft at 150 RPM. The belt was put on with an initial tension about equal to the additional tension to be carried when full power was transmitted (compare the rope tension with the two full buckets in the well) but the center distance between the two pulleys was ordinarily so great that the weight of the belt would make it hang with a graceful dip betw[illegible] two pulleys. The [illegible] would be so [illegible] varying wit[illegible] and moistu[illegible] air, a nearl[illegible] tension in[illegible]

years with a permanent efficiency of 98% and when finally discarded represented a handsome second hand value.

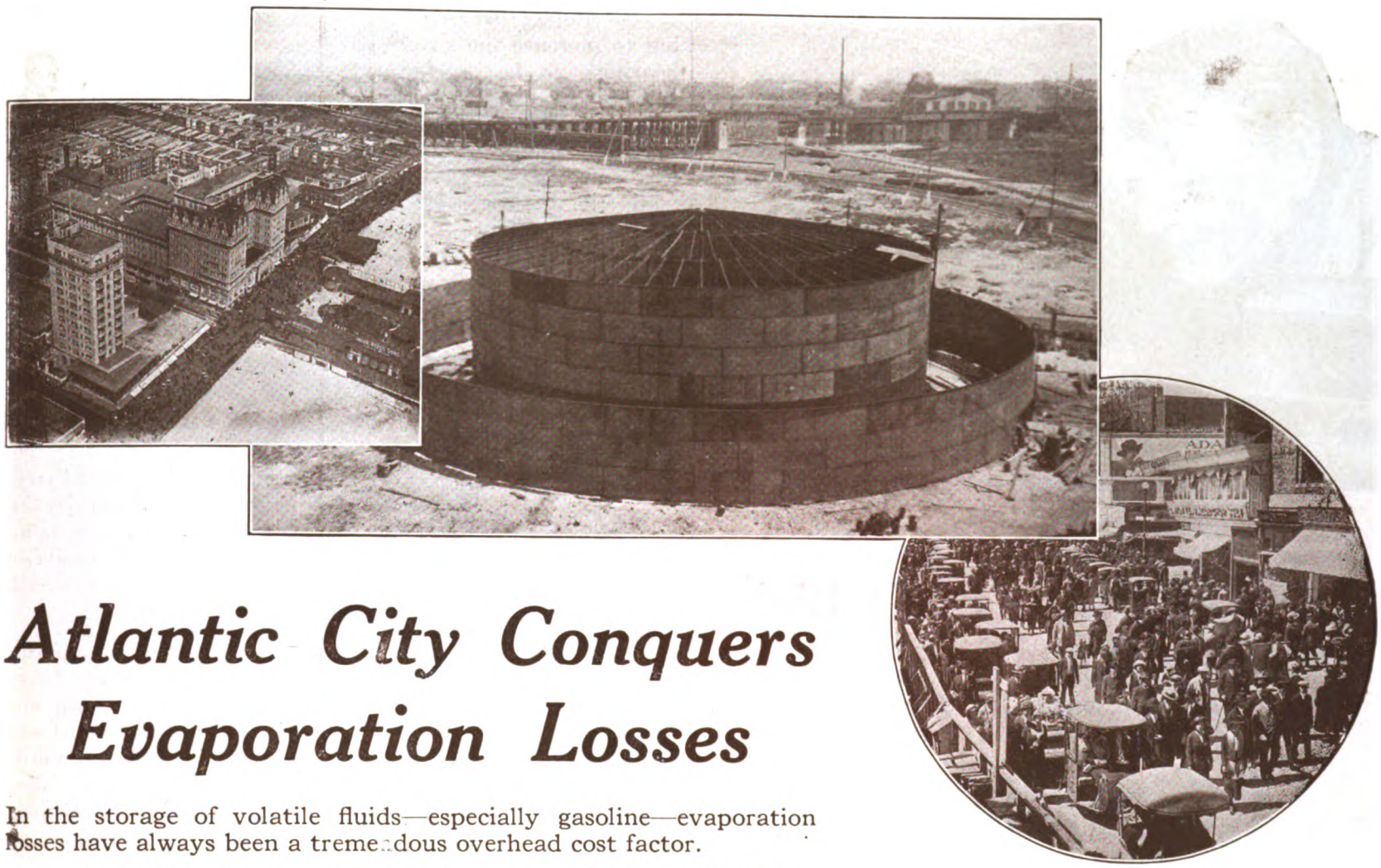
Nowadays, such ideal drive conditions are the exception. With the advent of the high speed electric motor as the well-nigh universal power unit, but no change in the speed of the lineshafting or driven machinery, high pulley ratios became the general rule. The disadvantage of this was further aggravated by the universal demand for short pulley centers and the consequent further decrease of the arc of contact of the belt and the small pulley; the result being unstable initial belt tension, slippage and burning of the belt.

For many years the only remedies thought of were either to tighten the belt or to increase the friction between the belt and the pulleys by the application of sticky pastes to the belt, or facing the pulleys with leather, fibre or canvas. In the instance of motors or generators it was a comparatively simple matter to tighten the belt by merely screwing the motor or generator back on its slide base. When the distance between the two pulleys could not be increased, belt tighteners were used. Such devices were also called tension idlers and were, as a rule, forced down on the belt by means of screws. Sometimes this was done on the slack side of the belt, but if more convenient, on the tight side of the belt. How much tension to apply, no one knew, and even if the operating engineer did know how to figure the proper initial tension he had no way of telling what the tension was except by flapping the belt by hand while idle to *feel out* the tension. Many years of experience might have given some value to tests of this kind, but what could not be foreseen was the effect of temperature and moisture changes in the surrounding atmosphere in shortening and lengthening the belt. Many a motor or generator, running fine one day with moderate heating of the bearings, would burn the bearings out the next day or burn the belt without any apparent reason.

For manufacturers of motors and generators, there was apparently nothing left to do

(*Continued on page 34*)

Digitized by Google



Atlantic City Conquers Evaporation Losses

In the storage of volatile fluids—especially gasoline—evaporation losses have always been a tremendous overhead cost factor.

Competent authority places evaporation losses as high as 30% of the total stored. Consider the waste—and cost—of such losses in a storage plant of 55,000 barrels capacity. Such a plant may be filled and emptied again—ten, twenty, fifty times per year.

In one year, evaporation losses can easily be much more than the cost of the storage plant.

A Tank that efficiently overcomes such losses would be low in cost regardless of construction price.

The above Lancaster Tank installation, recently completed at Atlantic City, overcomes evaporation losses but it did not cost any more than an ordinary storage tank.

To overcome evaporation losses, Lancaster *welded* the roof plates instead of riveting. An absolutely tight roof results and it costs no more than the riveted roof.

For high pressure storage, a Lancaster Tank—lap welded and double riveted—sets another efficiency record.

No matter what *you* store—oils gases, water, molasses—under pressure or otherwise, you can rely upon Lancaster Tank Engineering Service to design your Tanks for both safety *and* economy. Complete information regarding any kind of Tank for any purpose will be sent to you on request. Send in your problem today.



Wherever you see this Name Plate, you are certain of seeing a sturdy, safe and scientifically efficient Tank.

LANCASTER IRON WORKS, INC.

501 Fifth Avenue
New York

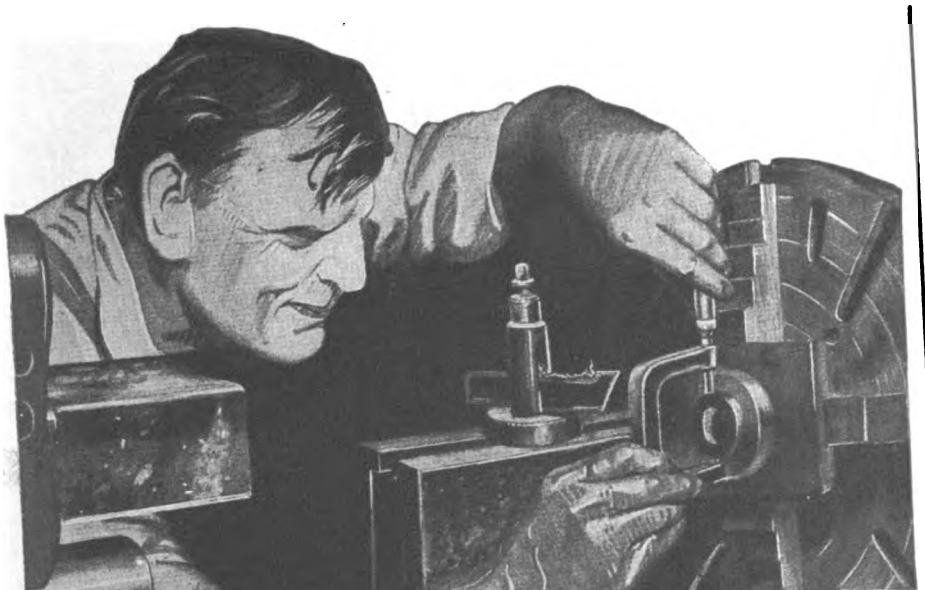
Wesley Building
Philadelphia

LANCASTER TANKS
STEEL PLATE CONSTRUCTION

Give this coupon to your Assistant with instructions to write for any or all of the books checked.

Book B-1	List prices and specifications on 303 sizes of Horizontal Storage Tanks from 100 to 25,000 gallons capacity.
Book B-2	Storage Tanks, sizes from 1,000 to 74,000 barrels capacity.
Book B-3	List prices and specifications of 134 Standard Sizes of Pressure Tanks.

Digitized by Google



This Man
Needs ALL of the BEST Light

The next time you think about lowering production costs, go out to your men's benches or machines and find out if they can actually see what they are doing! A man needs light to work—he needs all of the best light he can get.

Paint your dark, dingy walls and ceilings with SURLIGHT and you make them light reflectors; the daylight that enters your plant is reflected to workmen's tools and benches, where it belongs. Better work follows better light—when workmen can see their work better they can naturally do it better. Production is increased, spoilage reduced and accidents prevented.

SURLIGHT is a pure white paint—pure white when it is applied, pure white when it dries, and pure white after years of service. Can be washed as often as required without injury to its whiteness or light-reflecting properties. Furnished in gloss, egg-shell or flat finishes.

Sold in quantities direct to large corporation users only. Send for our De Luxe SURLIGHT book, a full treatise on the possibilities of this wonderful paint.

ST. LOUIS SURFACER & PAINT CO.
4202 Arlington Ave. St. Louis, Mo.

SURPACO
Trade-Mark

A Few Surpaco Products

Metalstee (for all exposed metal), Surname (white), Surlac (shellac substitute), Surfspar (water-proof varnish), Surlino (linseed oil substitute), Building Paints and Varnishes.

Special for Railroads
(Steam and Electric)

Metalsteel (for all exposed metal), Locomotive and Cab Enamel, Canvas Preserver, Canvas Roof Paint, Car Enamel, Car Floor Paint, Car Surfacer, Coach and Locomotive Varnish, Pole Paint (steel and wood), Seat enamel (rattan), Seat Varnish (rattan), Station and Building Paint.

Paint All Interiors with

SURLIGHT

The Light Reflecting Wall Paint for Industrial Purposes

(Co ntinued from page 32)

but to increase the size of the bearings, to be on the safe side, and supply three bearings for motors of 150 HP or at least 200 HP and up, when used for belted service. For a while the back geared motor came to the fore to give large diameter pulleys, and for a time designing engineers would have nothing but direct connected units wherever possible, otherwise chain or gear drives. This opinion still prevails among many.

The advent of the Lenix short center belt drive changed all this. As to the history of this invention it might be of interest to state that in the years of 1903 to 1905 a French captain of artillery named Leneveu invented and patented a device called the "Lenix", and the Lenix system of belt transmission became a new epoch in the evolution of belting practice. The peculiar trade name "Lenix" under which various companies all over the world were licensed to use the invention, was coined from the first syllable of the proper name Leneveu and the Roman numerals IX, the Roman numerals representing the nine following good points of the Lenix drive system.

1 High efficiency
2 Low first cost
3 Low maintenance cost
4 Low rate of depreciation
5 Simplicity of design
6 Noiselessness
7 Shock absorbing qualities
8 High ratio of transmission
9 Freedom in selection of location of pulleys and consequent economy of space.

While the Lenix, at first glance, appears to be a close cousin to the swinging idler pulley, as often found in lumber and saw mills, the relationship is perhaps on the same order as that of the old steam engine of James Watt to the modern Corliss or Unaflow steam engine.

Captain Leneveu was not only the first to introduce on a successful commercial basis the scientific and correct application of the flexible or resilient idler pulley on many existing drives, but he became the father of the short-center

(Continued on page 36)



"IT'S YOUR ORDER, Because Your Company Has a PHOTOSTAT."

"This is a job where delivery is paramount. And, in every case, I have made it a point to find out what kind of equipment the bidder had in order to make good his promise.

"Your Company has a piece of equipment on which I have learned to rely. I know what the PHOTOSTAT is and what it can do. I know you will not have to lose any time tracing. You can make PHOTOSTAT copies and get started on your shop work right away. In other words you'll be days ahead and I also know that there can't be any mistakes in PHOTOSTAT copies.

"Yes, sir, you tell your chief he can thank the PHOTOSTAT for this order. I know you'll make delivery with that machine to help you."

PHOTOSTAT prints cost cents. Compare this with what it costs for a draftsman to make a tracing, a stenographer to copy a page, or an artist to reproduce a layout.

The experiences of many users, written in letter form, are contained in our booklet, "A Good Word for the PHOTOSTAT." Write for your copy today.

PHOTOSTAT CORPORATION
295 STATE ST., ROCHESTER, N. Y.

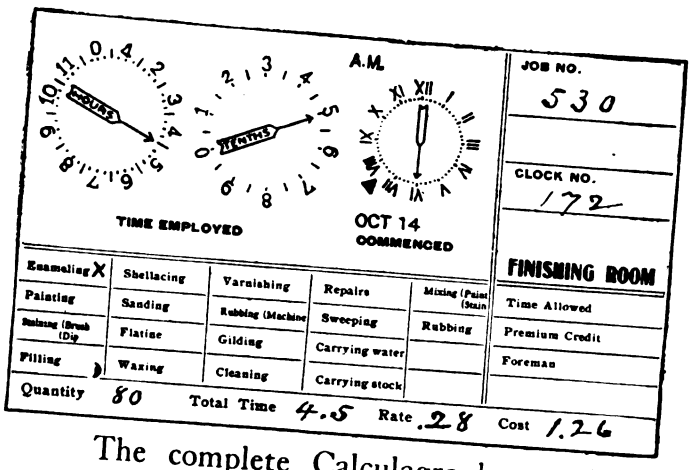
88 Broad St., Boston
123 W. Madison St., Chicago
209 Leader Bldg., Cleveland
7 Dey St., New York City
510 Nat. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington.

Executive Offices: Providence, R. I.

PHOTOSTAT
Trade Mark

Digitized by Google





The complete Calculagraph record reproduced above shows that a workman began enameling job No. 530 at 7:30 A. M., Oct. 14, and that the operation took four and five-tenths hours (hours and minutes printed if preferred.) The elapsed time record is read directly from the card, without any figuring or possibility of error.

The Calculagraph Records the Start, Finish and Elapsed Time for Any Number of Workmen

Its movement is that of a clock. An eight day, spring driven movement with jeweled balance, which must actually run before it will record elapsed time. The mere changing of the hands has no effect upon the printed record.

As it runs, it rotates continuously two discs of metal type. These print—through an automatically reversing carbon ribbon—the starting, stopping and elapsed time of each job. There is no jumping, no forcing and locking mechanism, and none of the wiring troubles so often found with electrically operated time recorders. Just the continuous movement of a finely adjusted clock.

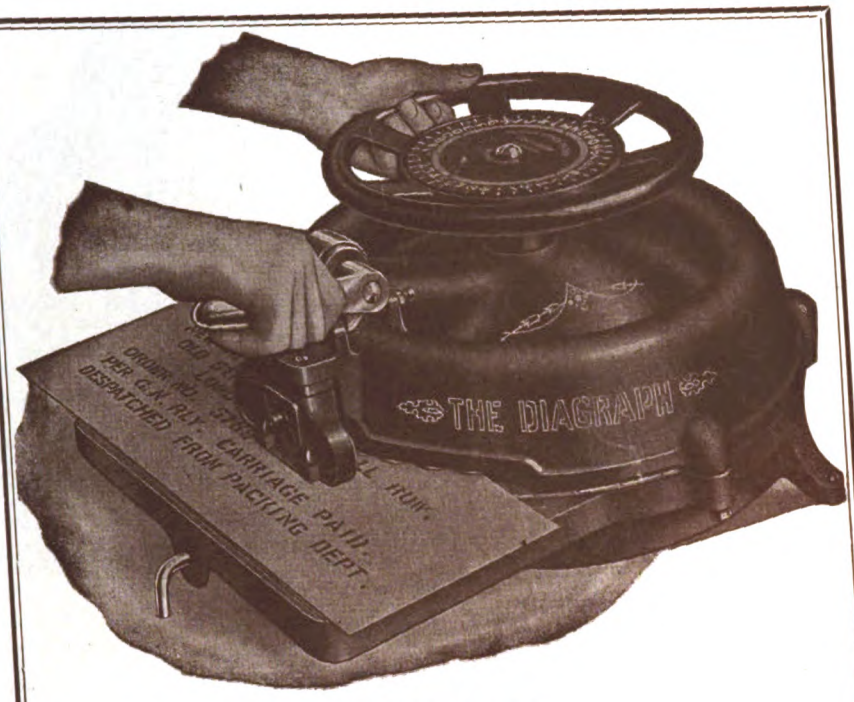
It is durable, simple to install, and weighs but sixteen pounds. Your records cannot be falsified. And the chance of error through subtracting starting time from stopping time is eliminated. For the Calculagraph prints, right on the job ticket, the elapsed time.

If you have never received a copy of our booklet, "Elapsed Time Records," send for it today.

THE CALCULAGRAPH
THE ELAPSED TIME RECORDER

34 Church Street, New York City

Digitized by Google



READ
"The Freight That Failed"
By Forrest Crissey

Every business man should read this illuminating article in the May 27th issue of The Saturday Evening Post. Mr. Crissey, in discussing the $100,000,000 annual freight claim losses, states that the use of stencils for addressing is a highly effective means of loss prevention. Read Mr. Crissey's article—then buy a Diagraph. Free trial in your own shipping room.

DIAGRAPH STENCIL MACHINE CORP.
1626 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities—see phone book.

For Your Own Protection
Learn How to Tell Genuine

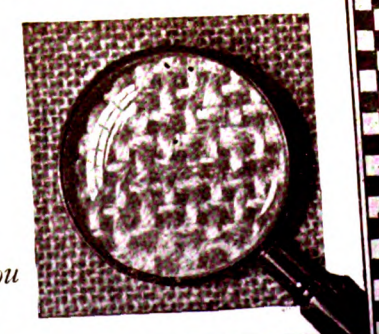
Linoleum

Look for the woven *Burlap* Back

BURLAP adds resiliency and flexibility to linoleum. Its tough fibres are not readily torn and give to linoleum its strength and durability. All genuine linoleum is built on a sturdy Burlap back.

Buy genuine linoleum for service, economy and permanent satisfaction.

JUTE
INDUSTRIES,
LTD.,
320 Broadway
New York City



Ask your merchant to show you the woven BURLAP back

(*Continued from page 34*)

belt drive by showing that to attain the highest efficiency in belt transmission, the arc of contact of *both* pulleys should be made as great as possible.

Whereas the arc of contact of the smaller pulley of a drive could be made a maximum by the proper application of the Leneveu principle, the simplest way of increasing the arc of contact of the larger pulley of the drive was to make the pulley centers as *short as possible*. Everybody seems to have known instinctively the effect of a large arc of contact when it comes to a rope around a hoisting drum, nigger-head or capstan; (refer to old well hoist) but when it comes to the belt drive, it was Captain Leneveu who first demonstrated that it was good economy to make, as far as possible, the entire pulley surface of both pulleys a working surface for the belt. With this drive system it was found that because of the great arcs of contact, the initial tension could be reduced to a minimum and the reverse bend of the belt when passing around the roller or wrapping pulley constituted no hardship on the belt, because of the practical absence of tension. As a matter of fact it was found that under certain favorable drive conditions on a well broken-in horizontal drive, the roller could be raised completely from the slack side of the belt after the drive had been started up and was carrying a uniform load. This test was carried out by the writer on a 35 HP compressor drive in a plant at Philadelphia and did more than many calculations to convince observers of the high efficiency and sound engineering principles of this method of short-center belt drive.

The action of the Lenix is entirely automatic and synchronous with the amount of power transmitted. The pressure of the roller on the slack side of the belt is calculated to correspond to the horsepower to be transmitted, belt speed and thickness and stiffness of the belt. This pressure is exerted constantly by means of counterweights. To compensate for the increasing pliability of the belt, the counterweights are adjustable. The automatic action is rather puzzling when observed for the first time. As the load comes on, the roller will instantly advance, establishing an increased arc of contact when most needed. On the other hand, as the load decreases the roller will recede, establishing a decreased arc of contact. The motion of the roller is a natural reflex movement, caused by the variations in the length of the belt, which in turn are caused by the changes in the belt tension corresponding to changes in the horsepower transmitted. As an old belting expert once expressed himself, after having observed a heavy 60″ wide, 3-ply belt drive before and after it had been equipped with this drive, "now you can see the belt breathe; before, it was as straight as a fiddle string."

Springs are never used to regulate the pressure of the roller and initial tension of the belt; only counterweights. For this reason the action can be calculated to a nicety taking fully into account the weight of the belt as the direction or rotation of the drive might be.

In this way, the vertical belt drive or the horizontal belt drive with the tight or pulling side on top, or any other direction of drive in between, becomes fully as efficient as the horizontal drive, tight side bottom.

This fact opens up a wonderfully wide field for the short center belt drive. A glance at the vertical beater drives illustrated, Fig. 8., will show that the Lenix principle, besides making a vertical short center drive as efficient as a long center liberally proportioned horizontal belt drive, also makes the drive an efficient starting and cutoff coupling, vastly superior to a loose and tight pulley arrangement, where, during the period of starting, one edge of the belt has to do all the work of acceleration, whereas here the full width of the belt and over three quarters of the surface of the pulley do the work.

A few drives were imported from France during 1905-6-7, but it was soon found that the French designs were too frail for American use and it was found necessary to redesign, or rather, reinforce, the French designs before they were manufactured in this country so they would stand up for the hard usage encountered in most places here. Several im-

(*Continued on page 40*)

Digitized by Google

Power without fuel problems

A Perfected Oil Engine for Industrial Purposes

Power production for many purposes need no longer be burdened with costly and uncontrollable coal problems. The Fulton Diesel has proved the high economy of a perfected means to use low-grade fuel oil in internal combustion. Fuel is always available—and pipe-line, rail and truck transportation insure deliveries against interruption.

The strongest endorsement of Fulton Diesel efficiency is found in the fact that, in many instances, the performance of one has led to the purchase of another. Side by side you find them in ice plants, flour mills, mines, cement plants, central stations, waterworks, oil pipe-line stations, etc.

The Fulton Diesel is an American built, stationary, internal combustion oil engine, suited to a wide range of industry. It operates on one-third of the fuel required to produce equal steam power. There are no stand-by losses, no delay in starting, no ash removal expense. Labor is reduced to one engineer. The whole cycle of power generation is in the single unit—saving investment in boilers, stacks and other steam plant auxiliaries.

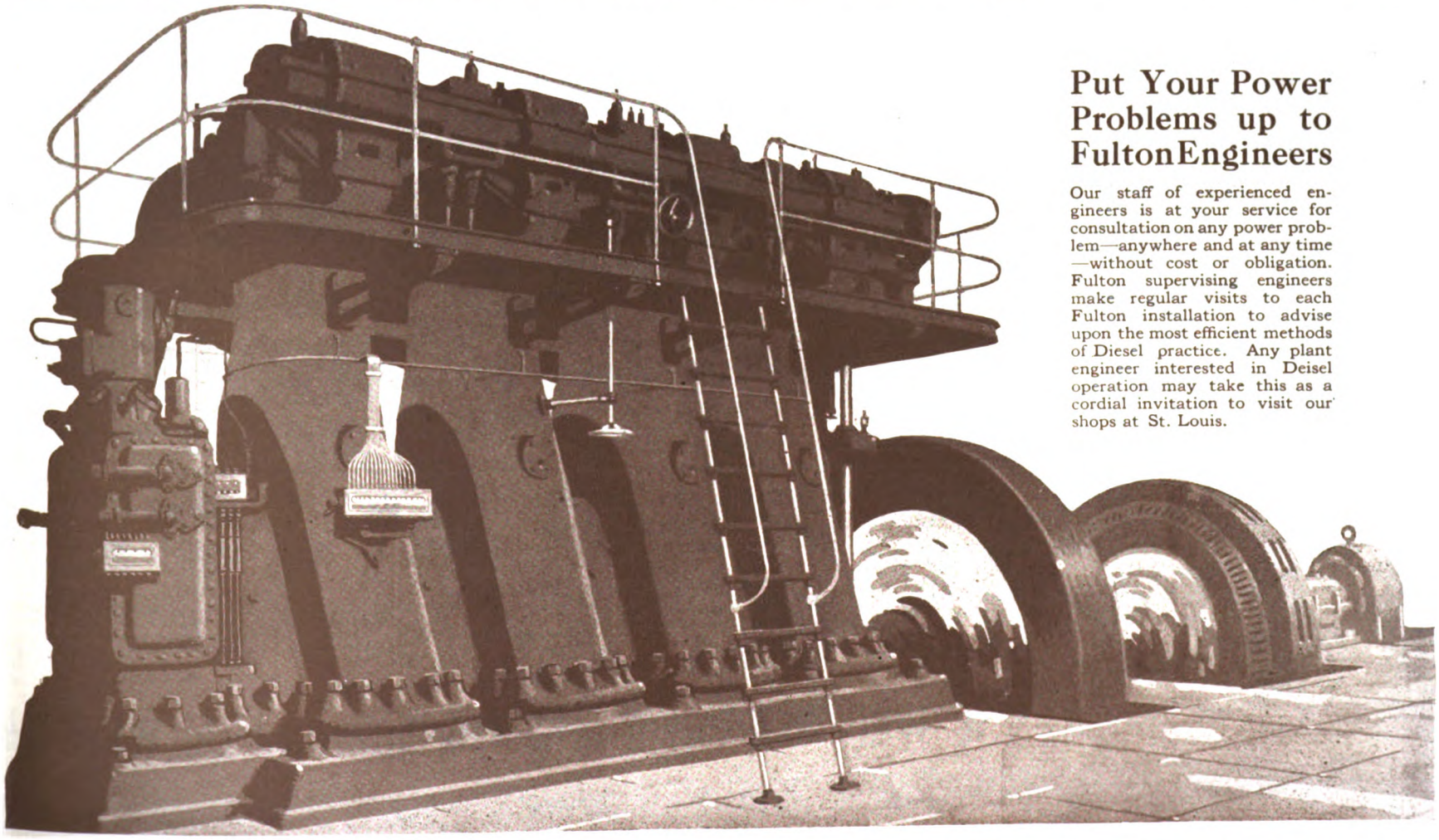
The Fulton Diesel is a product of 70 years successful engine building. By its mechanical efficiency it achieves the highest degree of power economy yet developed in a prime mover, through the elimination of so many factors contributing to power waste.

The story of the Fulton Diesel is one of the most important before American industry today. You only have to ask for us to send you—free and postpaid—a copy of our carefully written and fully illustrated booklet, describing the Fulton Diesel in detail.

Fulton Iron Works Company, St. Louis, U. S. A.

Successful Engine Builders for 70 years

Branch Offices: New York - 82 Wall St. Dallas, Texas - Praetorian Bldg. New Orleans - Hibernia Bank Bldg. Havana, Cuba - 401-403 Banco Nacional



Put Your Power Problems up to Fulton Engineers

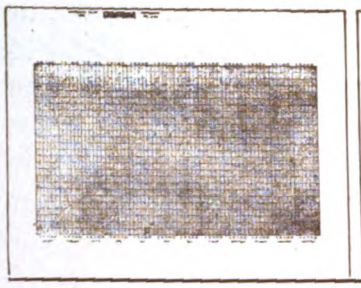
Our staff of experienced engineers is at your service for consultation on any power problem—anywhere and at any time—without cost or obligation. Fulton supervising engineers make regular visits to each Fulton installation to advise upon the most efficient methods of Diesel practice. Any plant engineer interested in Deisel operation may take this as a cordial invitation to visit our shops at St. Louis.

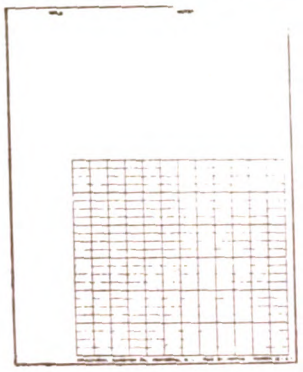
FULTON DIESEL

Digitized by Google

GRAPHICS HEA







EDEXCO CHARTING PAPERS

These are the sort of charting papers you want because;

1. They are printed on letter size paper, so that they are easy to file in letter files or bind up with typewritten reports.

2. Wide margins are left around the engravings for insertion of scales, heading and notes. They are printed on white (on one side only) in a color of ink which reproduces readily.

3. They are printed on paper which is strong enough to stand hard usage but which is unwatermarked and transparent so blue prints can be made.

4. Most EDEXCO sheets are specially divided for plotting business data by days, weeks, months and years and contain the right number of spaces for this purpose. EDEXCO curve cards also embody all these features.

5. The arithilog papers, are very necessary for comparing rates of large and small items, such as waste with production and advertising with sales.

A few of our forms are illustrated in the border. For more information ask for Catalogue H or better still send for—

OUTFIT A

Combination Laboratory Outfits on Charting $3.

This outfit contains charting paper and instruction booklets for a study of how to graphically record facts on charting paper. All styles are shown and besides annotated samples there are blank working sheets ready to try on your own business figures.

WORKING SHEETS

16 kinds 8½ x 11 inch charting paper: 8 blank and 8 with brief description of the uses on each. Ten sheets 8½ x 11 inch Arithilog Paper: one No. 179, 3-No. 180, 2-No. 181 and one each, No. 181½, No. 182, No. 183 and No. 184.

BOOKLETS OF INSTRUCTION

Pamphlet No. 805, "Standards for Graphic Presentation." Pamphlet No. 806, "Graphic Charts for the Business Man", —Gilman.
Series of 4 reprint articles "The Ratio Chart and its Applications."—P. A. Bivins.

OTHER EDEXCO SUPPLIES

Graphic Headquarters also carries in stock for your convenience many other devices you can't get readily elsewhere. For instance;—

Gummed Paper in colors. In sheet form or cut as tapes or symbols.

Colored Crayons, Oil Colors and Waterproof Inks.

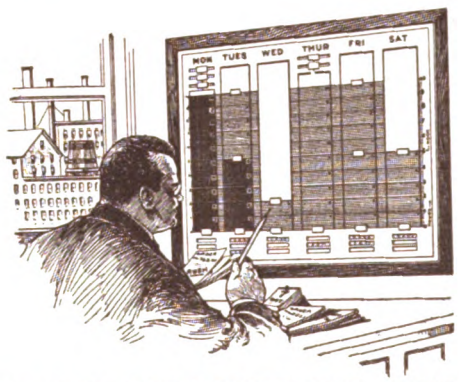
Swinging Leaf Fixtures with cork filled leaves.

Decimally-divided Stop Watches.

EDEXCO Cork Mount for maps, charts and bulletin boards. The best backing for pin charts in constant use.

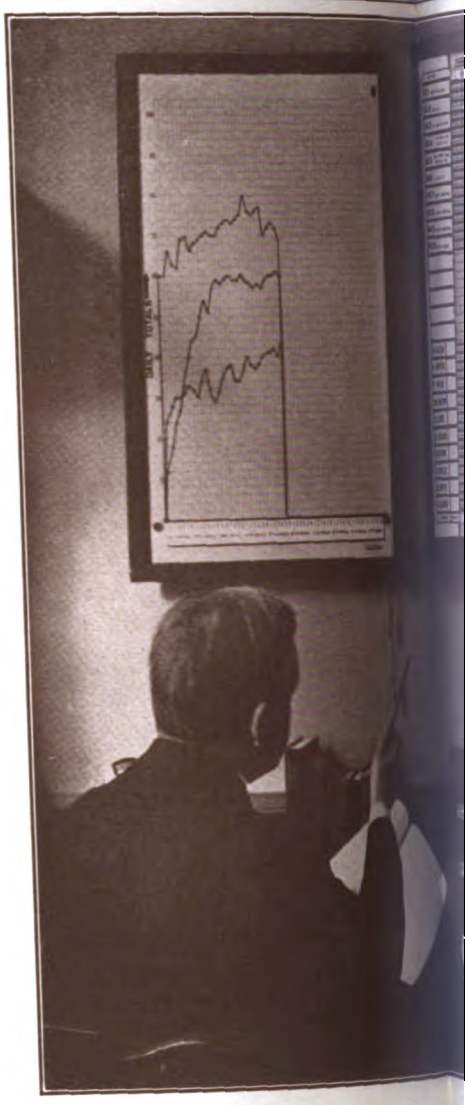
Books on Graphics.

Catalogue H will tell you more.



EDEXCO COMPOSITE BAR CHART

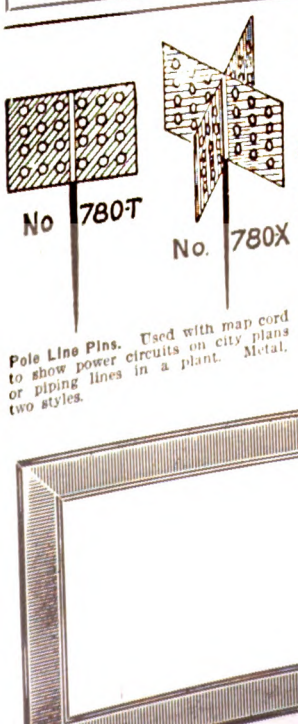
For showing condition or quantity of stock on hand or for assigning work to machines or departments.



EDEXCO MECHA

EDEXCO MECHANICAL BAR CHARTS, originat... factory control boards, showing amounts in various ... also been extensively used with great success as quota ... pulation, flexibility of use and neat appearance make ...

EDEXCO PINCORD CHARTS though newer are ... Graphs" goes into detail.



Pole Line Pins. Used with map cord to show power circuits on city plans or piping lines in a plant. Metal, two styles.



Series 300 Large spherical pin for display



Series 500 The Most Common Size used is this spherical head pin.



Series 600 For Congested Maps or charts and holding territory or route cord in place use this pin.



Series 5400 Glass Spot Pin. The spot is fused in the head of the pin. It cannot come off.



Series 5000 Enamel Spot or "Ring Pin." Spot is enameled on the glass. This and the glass spot pin photograph as a ring.



Series 5000 Special Markings Enamel Spots can be furnished as a DASH or CROSS if desired.



Series 7000 Oil Well Pin. Shape resembles oil well derrick. Can be supplied with two-colored head.



Series 6300



Series 6100



Series 6400



Series 6200



Series 3650

Triangular or Square Head pins are used where the 10 colors do not furnish sufficient variety. They also help color-blind users. These pins show distinctive shapes when photographed whereas some colors photograph the same.

Rough Surface ... Pencil will erase ... off from these ... again and again

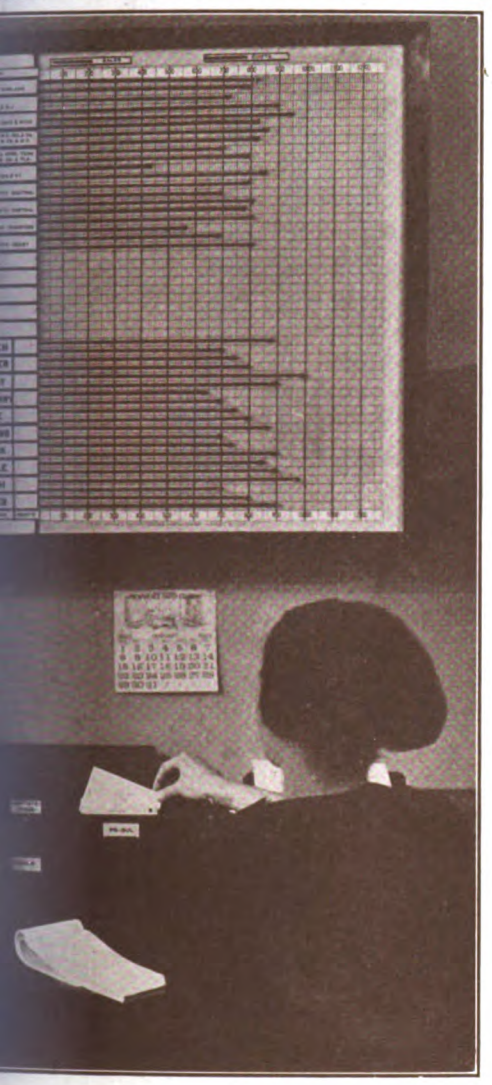
It Will Well Pay You To Be Informed On What Graphi

EDUCATIONAL EX

527 CUST... HOUSE STREET - - - - - - - - -

Digitized by Google

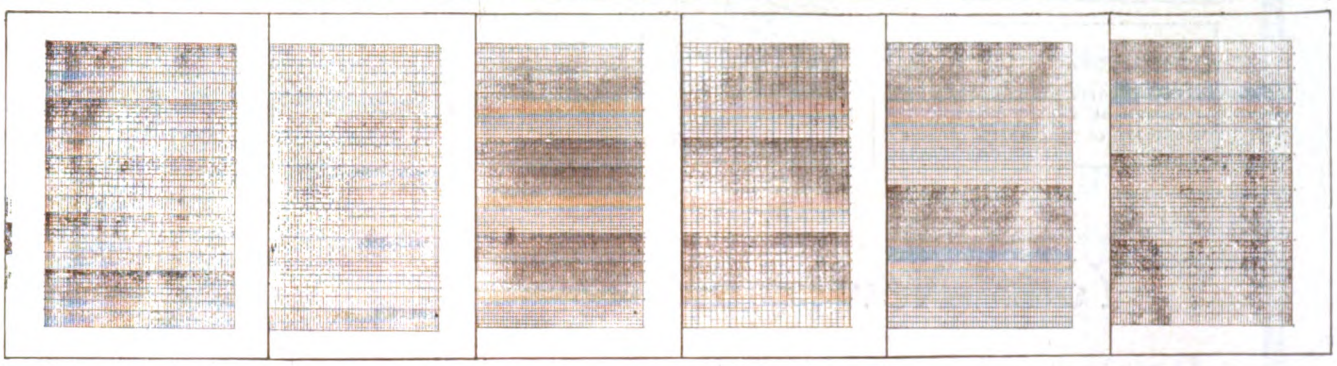
ADQUARTERS



ICAL GRAPHS

perfected exclusively by us, are especially useful as
s or for keeping perpetual inventory. They have
s for salesmen. Their brilliant colors, easy mani-
invaluable part of the conference or director's room.

valuable. Our illustrated pamphlet "Mechanical



EDEXCO OUTLINE MAPS

The sort of maps you want and can't get elsewhere.

Plain U. S. Outline Maps showing every state with no lettering, in several sizes.

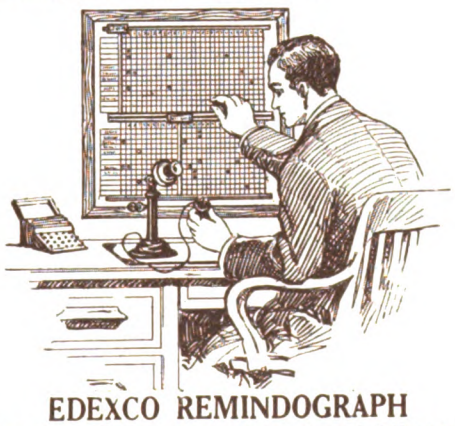
Individual State Maps showing county names and boundaries with plenty of room for coloring in or insertion of data in the handy 8½ x 11 inch size.

Large U. S. Maps showing all counties for sales territory work. Two sizes, one as large as 4 x 6 feet.

Maps of U. S. showing cities of given population; 25, 50 and 100 thousand respectively, corrected to latest census.

Also plain black and white maps showing railroads, cities and other details.

Catalogue H will give you details.



EDEXCO REMINDOGRAPH

An automatic mechanically operated follow-up device for routing orders through the factory or checking up on delivery of raw materials.

EDEXCO MAP PINS

These EDEXCO Markers for production charts and maps are available in 16 standard true colors and over 30 varieties among which the following are particularly useful.

1. Solid Color glass heads. The color is fused in and extends all the way through the homogeneous head.

2. Sharp steel needle points permit repeated use in production charts or sales maps. When EDEXCO Cork Mount is used 100 or more insertions in the same spot are possible.

3. Rough Surface Colored Pins you can write on with lnk or pencil. Erasures are easily made and pins can be used repeatedly.

4. Numbered Glass Head Pins with either black or white number against a brilliant color background.

5. Square and Triangular Pins which show up well in photostats or photographs where colors would otherwise disappear.

30 styles are shown in the lower border. For more information write for Catalogue H or better still send for—

OUTFIT B

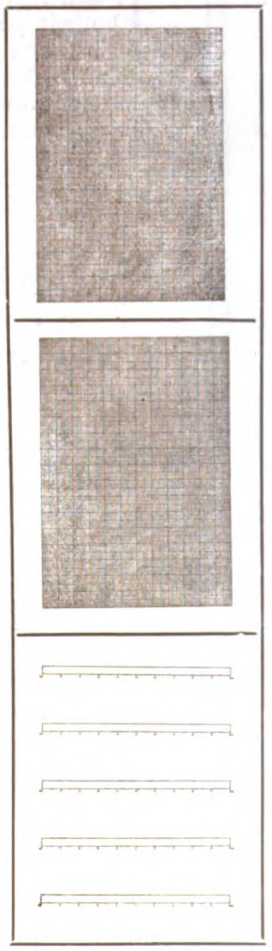
MAP MARKING OUTFIT—$2.00

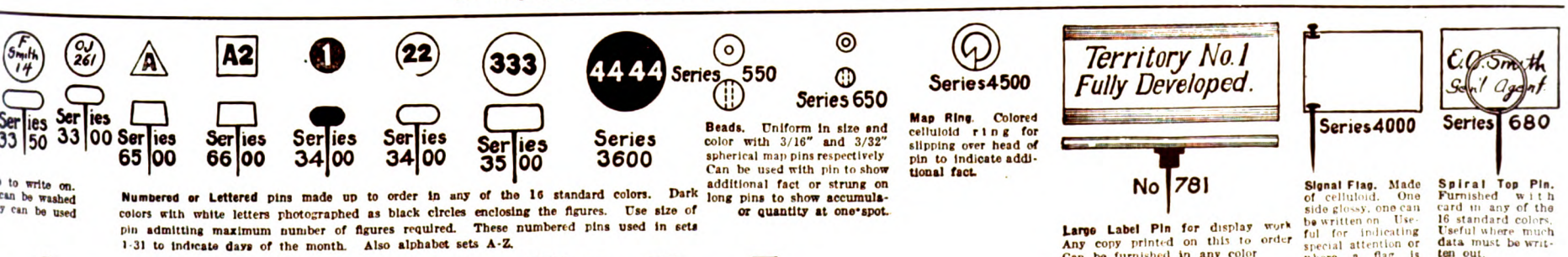
1 8½ x 11 inch Map of U. S. on EDEXCO Map Mount, with standard washable finish.

1 box of sample Map Markers, containing 100 map pins (some loose for experimentation).

1 box of 95 loose triangular, square and glass spot pins for special markers.

1 EDEXCO Primer of Graphics, telling how to mark maps.





to write on.
can be washed
y can be used

Numbered or Lettered pins made up to order in any of the 16 standard colors. Dark colors with white letters photographed as black circles enclosing the figures. Use size of pin admitting maximum number of figures required. These numbered pins used in sets 1-31 to indicate days of the month. Also alphabet sets A-Z.

Beads. Uniform in size and color with 3/16" and 3/32" spherical map pins respectively Can be used with pin to show additional fact or strung on long pins to show accumulation or quantity at one spot.

Map Ring. Colored celluloid ring for slipping over head of pin to indicate additional fact.

Large Label Pin for display work Any copy printed on this to order Can be furnished in any color

Signal Flag. Made of celluloid. One side glossy, one can be written on Useful for indicating special attention or where a flag is preferred to a pin.

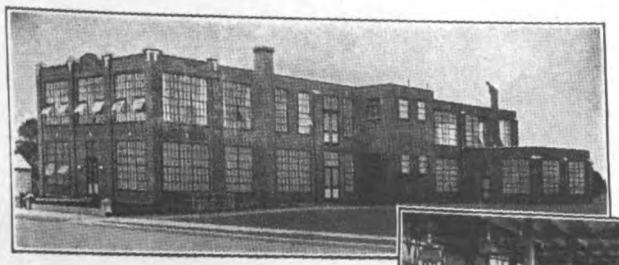
Spiral Top Pin. Furnished with card in any of the 16 standard colors. Useful where much data must be written out.

eadquarters Has Available, Write Now To

IBITION COMPANY

PROVIDENCE, RHODE ISLAND, U. S. A.

Digitized by Google



The Royerford Needle Works
erected in 47 days including entire mechanical equipment and installation of machinery.



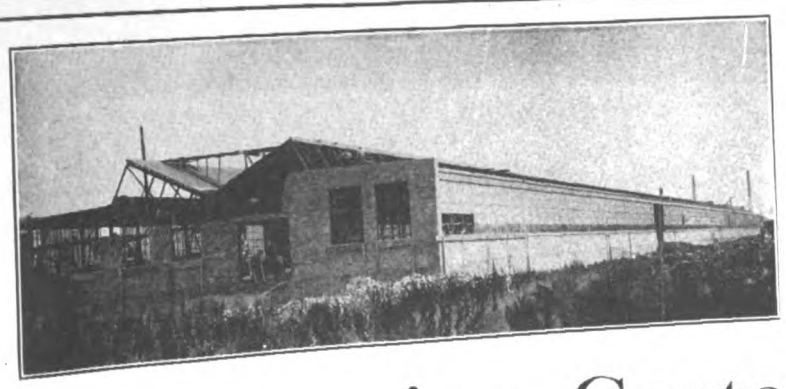
—INTERIOR—

Your New Building

IT can represent every modern improvement and yet be built in 30 to 90 days at a big saving, if you use Beling-Bush Standardized Buildings. Using our Method, you save because of centralized responsibility and on cost of plans and specifications. Write for booklet and information, and let us estimate.

Minimum Cost *Maximum Service*

The BELING~BUSH CO., INC.
FACTORY ENGINEERS AND BUILDERS
Drexel Building Philadelphia Pa.



Construction Costs Have Reached the Bottom!

THE cost of building factory structures is at the lowest point since 1913. The increase in demand for additional manufacturing space which is already following the resumption of activities in many lines will soon produce an increase in building costs. Those who need factory space but have waited for the lowest point in building costs can profit by building during 1922.

An additional saving can be made by employing "MRBN" Engineers to plan the building for you. Write for one of the members of our firm to come and outline to you our method of handling the design of industrial buildings at minimum cost to you.

Thirty Years
MRBN
of
Industrial Buildings

Build Now!

MILLS · RHINES · BELLMAN & NORDHOFF
Engineers
TOLEDO · OHIO

(*Continued from page 36*)

provements were gradually incorporated in the Americanized Lenix, making this a rugged and dependable unit, years ago adopted by many manufacturers as a standard in connection with their installations.

The accompanying illustrations are not of *unusual* applications, but are typical of the many thousands of short center belt drives installed and operating on units ranging from 1 to 1400 horsepower.

The illustration at the beginning of this article shows the installation in the Munroe-Taylor Building, New York; one of the first installations in this country. The drive is a 65 HP steam engine-driven generator, the original pulley centers being 160 in. The old location of the generator is recognized by the floor patch. This drive was particularly troublesome. High initial tension, large quantities of belt dressing and pulley faces lagged with canvas failed to prevent belt slippage or sudden and wide variations in the voltage, noticeable by the flickering of the lights in the building. This trouble was immediately remedied by the Lenix and the pulley centers were reduced to 6 ft. 6 in. The drive has been running since June 14, 1908, and excepting one new belt, the outlay for upkeep has been "not a cent," which speaks well for Captain Leneveu's principle.

On the same page is a 500 HP motor-driven ammonia compressor in a local ice plant. In chaning from steam to electric drive, the owners of this plant were confronted with the problem of installing a belt drive in the space occupied by the old steam engine. This was easily done with the Lenix. The compressor pulley is 20 ft. in diameter and the pulley centers are 20 ft. The drive is transmitting the 500 HP at a belt speed of 5,000 ft. per minute.

As a matter of fact, what Captain Leneveu really did, was to strike away from tradition; thereby completely wrecking the gospel of belt-drive engineers as to possible minimum pulley-center distances.

Safeguarding Quality in Motor Car Production

(*Continued from page 16*)

from special alloy steel under steam hammers in the Packard forge shop. It would require more space than is available for this entire article to describe the successive inspections that are carried out on the ring gear alone. This job is completely ground, by the way, including the surfaces of the spiral bevel teeth, the latter of course after hardening. Indicating tests are carried out in almost every step of the process and matching tests of the pinion and gear both before and after hardening. The accompanying illustrations give an idea of how the sets are matched up and run in to secure quietness and full tooth bearing.

Closely akin to inspection, or better, a part of it in a motor plant, is the testing department where motors are put through their paces, tried out, tuned up and adjusted. All Packard motors are given first a ten-hour dynamometer run in the general motor test room, the electrical power thus generated being turned back into factory use. Next the motors are taken one at a time into individual "quiet rooms" where they are carefully tested with stethoscopes and are given their final perfecting. In addition to this, every motor receives a gasolene consumption test and one in every five an oil consumption test, both of these latter tests being conducted under brake loads.

The quality of materials and workmanship are not the only thing safeguarded at this plant. The physical condition of factory executives is provided for by a systematic gymnasium course in the new gymnasium. Executives are assigned to individual and group instruction aggregating from two to three hours a week. Thus the mental capacity of the executives of sedentary occupation is safeguarded equally with the quality of twin sixes, single sixes, and trucks.

Digitized by Google

"Foremen Training is here to Stay"

"The foreman of to-day has to know as much as the superintendent or manager of ten years ago," says John H. Van Deventer, Editor of Industrial Management. "This being so," he goes on, "foremen training is here to stay."

During the past four years the Business Training Corporation has conducted not less than 80 per cent of all training for foremen in the United States. This work is carried on through a carefully organized program of text-reading, problem work, and meetings for stimulating lectures and discussions. The training course in Modern Production Methods has aroused the keenest interest of nearly 35000 men and has helped over 500 plants in every branch of industry to keep in step with the times.

These plants are better prepared because of their skilled and energized foremanship to meet this year's demands for increased production at lower cost.

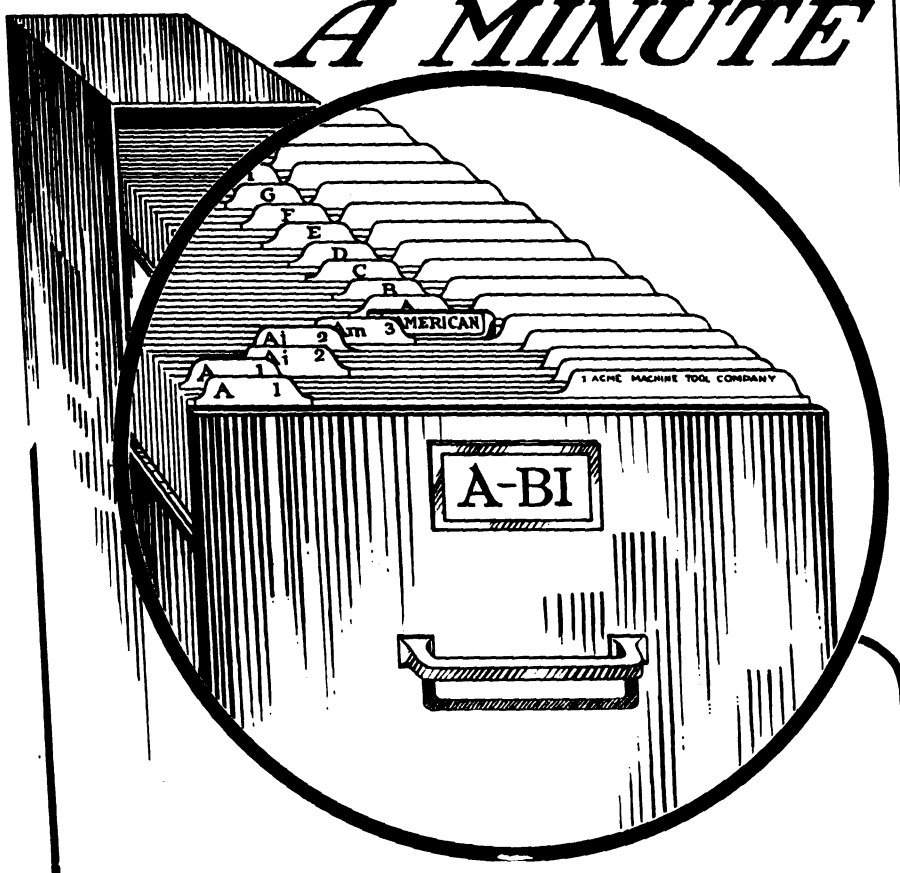
Ask for a copy of our booklet called, "Making Better Foremen." Every plant manager or other executive officer should have a copy. It contains worth-while suggestions for strengthening the stability and profits of your business. Write for your copy to-day.

BUSINESS TRAINING CORPORATION

185 Madison Ave. New York City

Digitized by Google

TEN LETTERS A MINUTE



THIS is what may be expected of the ordinary file clerk when Globe-Wernicke Sectional Filing Cabinets equipped with the Globe-Wernicke Safeguard Method of Filing and Finding papers are used. This system is swift, simple and accurate. No other can equal it for efficiency.

The easy-sliding drawers of the cabinet plainly labeled, the clearness of the indexing in each file make possible this extraordinary efficiency. The Globe-Wernicke filing system is mistake proof. An important paper, when desired, is instantly at hand.

The cabinets themselves, with their sectional construction, may be adjusted for growth with increased activities.

Write today for our chart in colors entitled the Globe-Wernicke Rainbow Division of "The Safeguard Method of Filing and Finding Papers." This chart clearly explains the best filing system ever devised.

Send This Coupon

The Globe-Wernicke Co., Dept. I. I. 8, Cincinnati, O.

Please send without charge your chart "The Safeguard Method of Filing and Finding Papers."

Name .....

Address .....

Globe-Wernicke

"BUILT TO ENDURE"

FILES BOOKCASES SAFES

Cincinnati

Main Office

Branch Offices

Boston
New York
Philadelphia

Washington
Detroit
Cleveland

Chicago
St. Louis
New Orleans

Cutting Costs on the Road "From Here to There"

(*Continued from page 21*)

vania manufacturer was able to eliminate twenty-two men—with a saving of $66 per day, $19,800 a year, in wages alone. And in a New England wire works one industrial truck, by practically eliminating all rehandling of materials, has replaced eight men—with a saving in wages of $9720 a year.

Many types of machinery have been evolved for cutting down the cost of moving goods and materials. Probably none of these has had a wider application than that ingenious device invented by a paper mill superintendent some ten years ago.

This paper mill superintendent saw that each lot of his raw materials and finished paper was handled many times. Pulp lap, for example, was unloaded from car to receiving platform floor. Then it was picked up, loaded on factory truck, and hauled to the storage room—unloaded again and stacked. Later on it was again loaded on a factory truck, hauled to the Beater, unloaded, and stacked. Each lot of paper on its way through cutting and other operations was repeatedly loaded, unloaded, and stacked at each transfer. And finally the move from storage to packing room and on to shipping platform—the same loading and unloading operations repeated all over again. So much handling soiled and damaged the paper; every repetition in loading, unloading and stacking wasted time, labor, and money.

How was all this rehandling to be eliminated? It was a worth while problem. Finally the idea came. Why not carry these loads on raised platforms? Why not design a truck which could be rolled between the platform legs and mechanically elevated so as to pick up the platform and its load; which could be mechanically lowered at unloading point, depositing the platform and its load on the floor? Such a truck would eliminate the time and labor involved in hand loading and in later unloading and restacking. A few odds and ends picked up here and there in the plant—and the first hand lift truck was born. In fact, this was the conception of the entire lift truck and skid system—a system that has saved thousands upon thousands of dollars for concerns that have adopted it.

To day the hand lift truck and skid system is used for cutting handling costs by practically every type of business which involves the handling of goods and materials—from the manufacturer who built your utomobile down to the laundry who mangles your shirts.

Generally speaking, a hand lift truck is an industrial truck with a platform which, through mechanical assistance, can be elevated by depressing or pumping the truck handle. Its lifting mechanism is provided with leverage so powerful that one man can easily raise a load weighing thousands of pounds. Lowering is accomplished by simply pressing a foot pedal The skid platforms used with the hand lift truck are built in numerous types to accommodate the material which they are to carry—some with plain, flat platforms; other with trays racks, containers and other ingenious rigs, for holding everything imaginable, from rubber tires down to cakes and pies.

But how does the hand lift truck and skid system function? How does it accomplish the economies claimed for it? Let us take a typical writing paper manufacturing plant for example:

In the first place the pulp lap is shipped from the pulp mill on skid platforms. No manual unloading from car to receiving platform, no manual loading from receiving platform onto platform trucks or other similar conveyances, is necessary. Instead, one man rolls a hand lift truck onto the car, pushes it between the legs of a skid platform, pumps or depresses the truck handle, and he's off with the skid platform and its load in a few seconds. At storage room he rolls the truck into position and steps on the foot pedal, leaving the skid platform in place with its

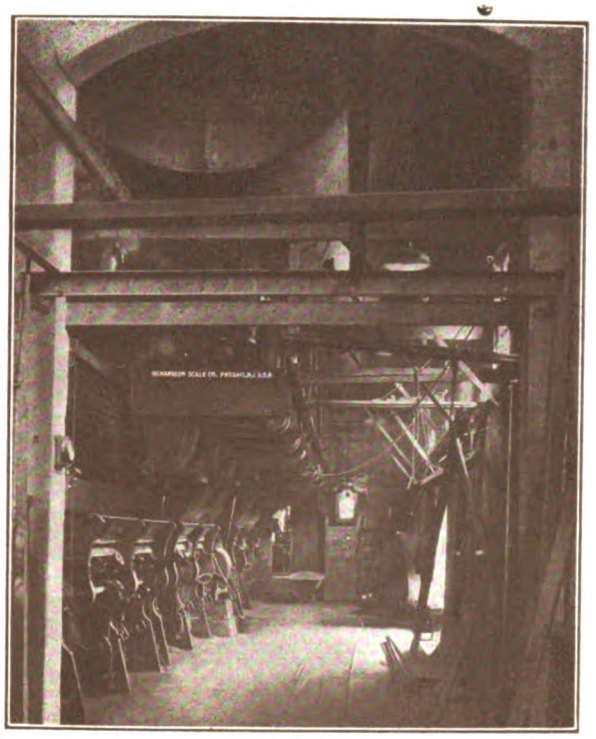
(*Continued on page 46*)

Digitized by Google

Find Out Exactly How Much Coal Your Boilers Are Using

Hidden Wastes Between Coal Bunkers and Ash Pit Can Be Easily Detected By Weighing Your Coal In a

Richardson



Richardson Automatic Coal Scale

WILL GIVE YOU AN ACCURATE AND CONTINUOUS RECORD OF THE EXACT AMOUNT OF COAL USED DAY AND NIGHT BY EVERY BOILER IN YOUR PLANT

Soot, scale, holes in the fire, faulty boiler linings, etc., all tend to lower the efficiency of a boiler. Incomplete combustion results, and part of the potential energy, instead of being transformed into heat units, is lost up the stack or down the ash pit.

With 65% of your power costs figured in dollars and cents for coal, what would it mean to discover these faults before they have a chance to dig into your profits?

A RICHARDSON installed beneath an overhead bunker for direct feeding to stoker will give you the direct control you need.

Send today for Bulletin 4122-A

RICHARDSON SCALE COMPANY

Passaic, New Jersey

New York · Boston · Buffalo · Chicago · Minneapolis
Omaha · Wichita · San Francisco · Memphis · Atlanta

Steel Throughout for Permanence

The installation of a Caldwell Hemispherical Tank and Latticed Column Tower is the final solution of large water supply problems. The rugged construction of this combination, the excellence of the carefully selected materials and the painstaking workmanship make it the choice of exacting engineers.



The tank, conservatively designed and amply riveted; erected in our shops before shipping to ensure easy assembly at destination. The tower, a model of modern structural steel work.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook Street
Louisville, Kentucky

Caldwell TANKS AND TOWERS

Which Boiler Is Wasting Your Money?



You can soon tell which boiler is using an excess amount of coal by knowing exactly how much each boiler is using.

The "C.J." COAL METER

with no expense of operation and for a trifling first cost measures every pound of coal entering the furnace. The results will soon be evident in reduced coal bills.

It stops leaks, checks wasteful firing and gives accurate records which enables you to figure costs.

Adapted to Jones, Taylor, Westinghouse, Sanford Riley and Detroit Stokers.

Send This Coupon

We are willing to prove all our claims by sending a C. J. Coal Meter on 30 days trial. Fill out the coupon and mail it today.

C. J. Mfg. Company
3401 N. 5th St., Philadelphia, Pa:

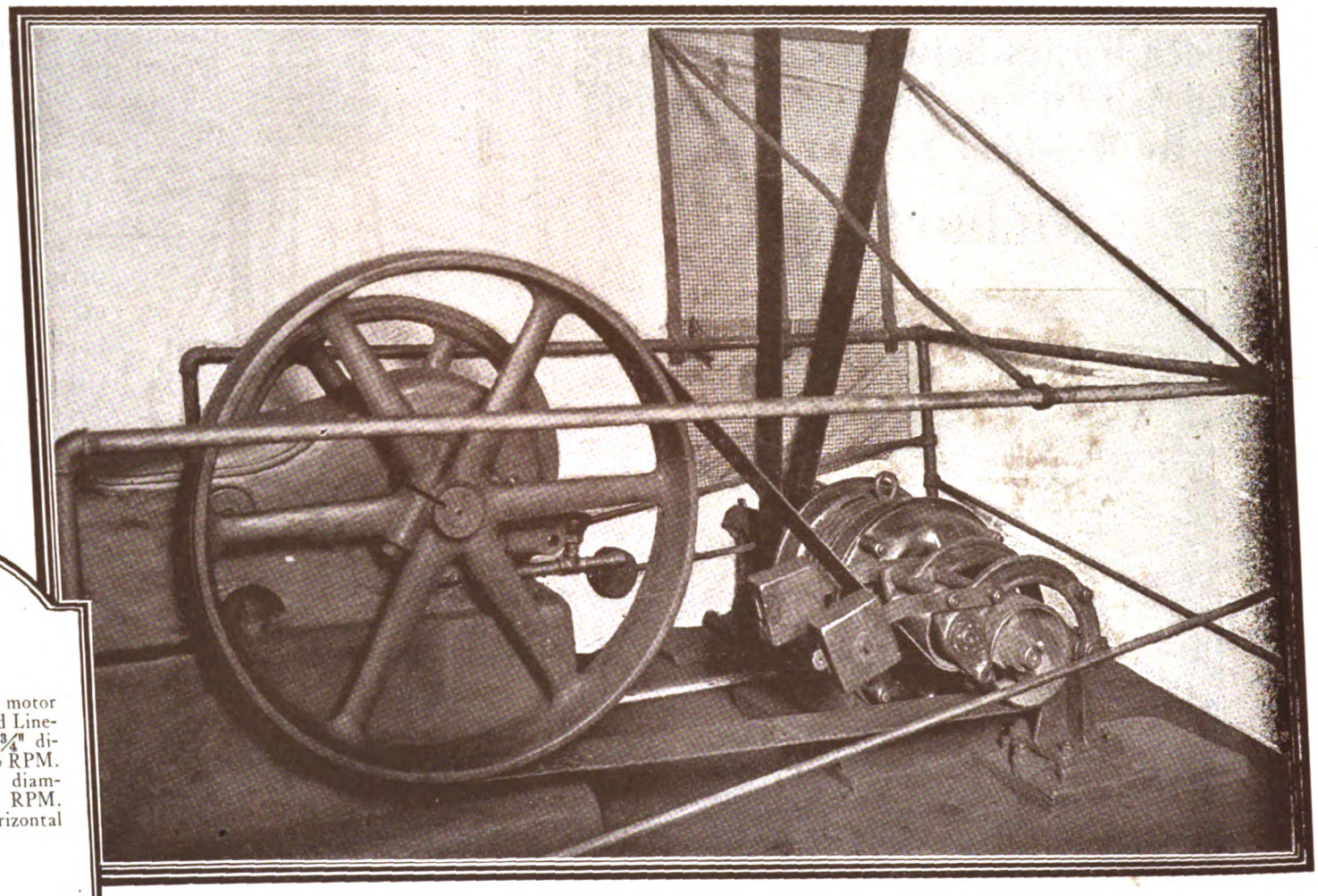
C. J. Mfg. Co.
3400 N. 5th St.
Philadelphia, Pa.

Please send a C.J. circular and details of your 30 days free trial. We have the following types of

Boilers .....
Name .....
Company .....
Address .....

Digitized by Google

THE LENIX



15 HP Double headed motor driving Compressor and Lineshaft. Motor pulley 8¾" diameter, 5½" face, 1150 RPM. Compressor pulley 48" diameter, 5½" face, 280 RPM. Pulley centers — horizontal drive, 4'0".

The Original Short Center Belt Drive

In 1905 the first LENIX was installed in this country.

Today many thousands of LENIXES are transmitting millions of horsepower, in units of from 1 to 1400 HP.

The wide range of applications in practically every industry of the country testifies to the success of the LENIX.

The LENIX eliminates up to 90% of the *initial tension* found in the belt of an ordinary open belt drive. This means that the resulting bearing pressures are reduced to a minimum—Saving *friction losses, renewal of bearings and lubrication.*

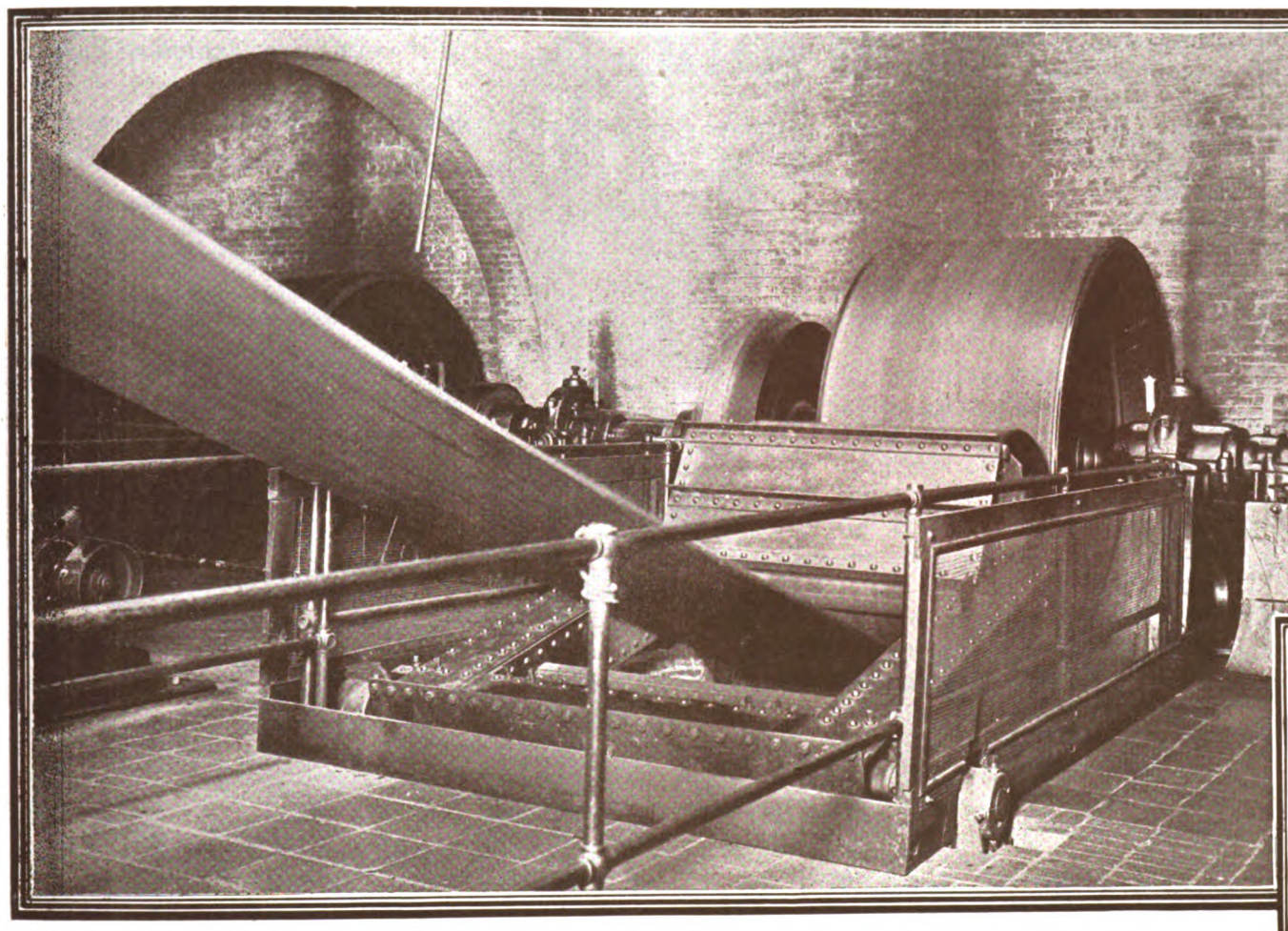
Short pulley centers are not only possible but preferable with the LENIX—Saving *floor space and belting.*

Ask for booklet
"Saving Slippage and Space."

F. L. SMIDTH & CO.

Digitized by Google

BELT DRIVE



1400 HP Steam Engine Driving Lineshaft. Engine Pulley 216" diameter, 53" face, 90 RPM. Lineshaft pulley 96" diameter 52" face, 200RPM 3-Ply leather belt, 50" wide, 11/16" thick.

17 Years Successful Development

Belt slippage is eliminated—Saving *power* and increasing the life of the belt.

The LENIX brings the hitherto unused surfaces of the belt and pulleys into working contact.

It maintains constantly and accurately the proper tension in the slack side of the belt irrespective of atmospheric and temperature changes.

It *automatically* follows the peaks and valleys of the load by a corresponding increase or decrease in the arc of belt and pulley contacts, synchronous with the variations.

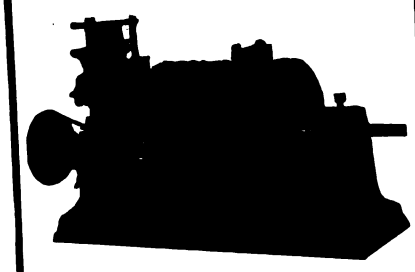
Ask for booklet
"Saving Slippage and Space."

Engineers

50 CHURCH ST.
NEW YORK

Digitized by Google

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway New York

(*Continued from page 42*)

load neatly stacked. Three manual handling operations are eliminated in connection with every one of these truck loads in this single transfer.

Now consider what happens when the pulp is transferred from storage room to the Beater. There's no reloading to be done. One man brings a hand lift truck to the storage room and picks up a load of pulp and its skid platform without even touching the load. At the Beater there's no unloading to be done. Pressure on the foot pedal—and skid platform and load are on the floor. Here, two manual handling operations are eliminated at every transfer of a truck load.

After the beating operation the pulp mixture is pumped to the Paper Making Machine, is sprayed into one end of the machine, and comes out at the other end a finished roll of paper.

At this point a series of transfers begin that formerly involved repeated loading, unloading, stacking, and restacking. First, the paper roll must be transferred from the Paper Making Machine to the Cutting Machine and Lay Boy. This is accomplished through the agency of either a monorail hoist or hand lift truck and platform skid.

The Cutting Machine cuts the paper into full size sheets which are fed into the Lay Boy and automatically laid and stacked on a slung skid platform. As the sheets build up on this skid platform, the platform is gradually lowered until finally it rests on the floor with its full load of paper and is ready to be conveyed to the storage room. This transfer is made without the necessity of manual loading and at the storage room there is no manual unloading or restacking. A hand lift truck is rolled under the skid platform and its load, elevated and hauled to the storage room. Here, pressure on the truck foot pedal deposits the skid platform and its load on the floor, where the load is left, still neatly stacked on the skid platform—kept clear of the floor, clean, and dry.

To fill an order, the paper is requisitioned from the storage room and is transferred to the Sizing Cutter. In the storage

(*Continued on page 49*)

"WHITE STAR"

TRIPLE-ACTING *NON-RETURN*

REGULATING BOILER CHECK VALVE

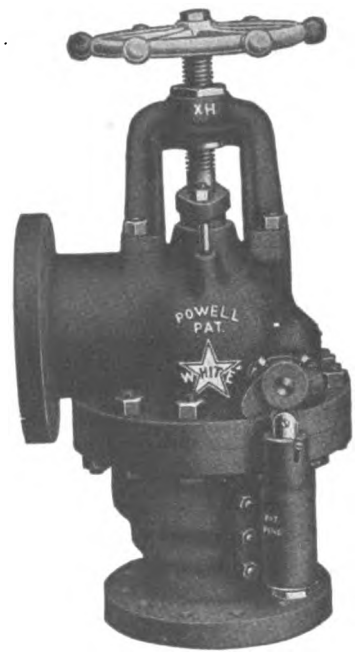


Fig. 2228
Standard Steam Pressure 250 lbs.

Who Pays the Bill

If your boiler explodes, causing damage to property—your own and others—and results in loss of life?

Can you, in extenuation, truthfully say you have observed all due caution and supplied adequate preventive measures?

Serious accidents cannot happen if the owell Triple-acting Boiler Check Valve is in the steam line. If a boiler tube blows the valve instantly closes, isolating that boiler from the others.

Write for bulletins and learn the secret of Powell Valve superiority.

The Wm. POWELL CO.
2525 SPRING GROVE AVENUE
CINCINNATI, OHIO

POWELL VALVES

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width	$10.68
9½ " "	11.93
11½ " "	14.00
12¼ " "	15.45
13 " "	16.00
14 " "	17.59
15 " "	18.84
18 " "	22.00
18¼ " "	22.90
24¼ " "	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. *Our Customers will benefit.*

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company

(An Independent Corporation)

ROCHESTER, N. Y.

Digitized by Google

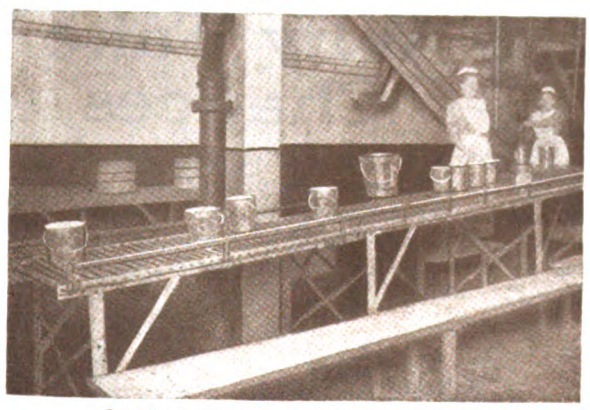
Safeguard Against Labor Shortage

THE labor situation makes it imperative to take steps immediately to prevent a serious curtailment of your output. Whether or not your business is listed as essential makes little difference. The present shortage can only grow more acute and make itself felt in every line of manufacture.

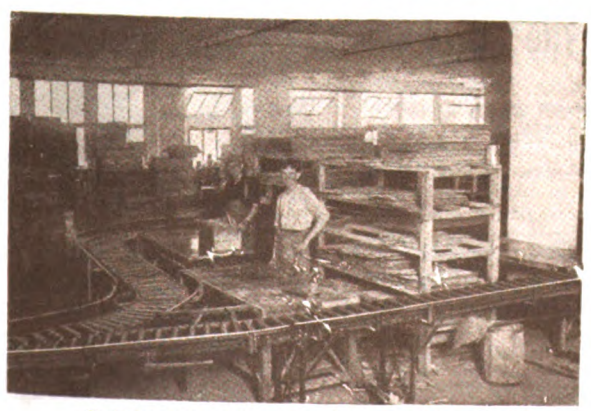
The first and most practical economy should be to eliminate hand conveying. This has become a form of labor wastage, for in the majority of cases, man power can be supplanted by the Mathews Gravity Roller Conveyer. Gravity conveying not only cuts down your payroll but it cuts out unnecessary delays, breakage costs and the unreliability of unskilled labor.



Bringing in the fresh fruit from the car or wagon



Gravity carries pails or boxes of cans equally well



Switches bring different products to a shipping point

Many of America's largest and most far-sighted manufacturers foresaw present conditions and realized the value of the Mathews Gravity Roller Conveyer in such an emergency. Their experiences have proved conclusively that it pays for itself many times over in labor saved. You too can raise the efficiency of your plant with the

MATHEWS
SPEED ECONOMY
GRAVITY ROLLER CONVEYER

Gravity eliminates heavy conveying from the packing room and other departments. This condition enables you to replace men with women and makes you further independent of labor conditions.

The Mathews Gravity Carrier Company manufacture the most highly perfected gravity conveying system now on the market. The system is so complete in fact, that it can be adapted to the needs of practically any plant. We maintain a staff of engineers to solve conveying problems of unusual difficulty. Let us help you cut the cost of production and speed up work. Drop us a line.

MATHEWS GRAVITY CARRIER CO.
122 Tenth Street, Ellwood City, Pa.
Branch Factories: Toronto, Canada—London, England

Digitized by Google

BUILT STRONGER LASTS LONGER

G-W MATERIAL HANDLING EQUIPMENT



A Handful—

or A Yardful?

Manufacturers who had the foresight to provide for an auxiliary coal supply are practically undisturbed by the present coal shortage—many of them have profited by it. But thousands of manufacturers are suffering from empty coal bunkers.

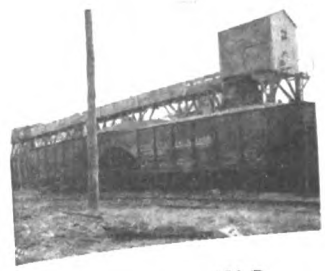


What about future coal shortages—have you prepared for them?

An auxiliary coal supply does not call for extensive handling equipment. For example, a G-W Ground Storage Plant, of the type illustrated, is simple in construction and very conservative in first cost. Its maintenance is extremely low, it can be located so as to utilize waste ground, and its ample storage facilities permit the purchase of coal when the market is most favorable.



Insure now against future coal shortages. A talk with a Gifford-Wood representative and a survey of your plant may save you many days of worry—and they entail not the slightest cost or obligation.



104-R

Gifford-Wood Co.
HUDSON N Y
WORKS
NEW YORK-CHICAGO
BUFFALO

ALLIGATOR
TRADE MARK REG. U.S. PAT. OFFICE
STEEL BELT LACING

Belt Men Know

Belt men know—and their recommendation of Alligator Steel Belt Lacing is eloquent testimony.

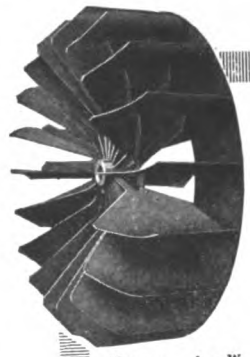
Alligator blends its performance into the belt and users often find in it, length of service equal to the belt itself.

Standardize on Alligator in your plant. Sold through "Jobber-Dealer" trade channels the world over.

Our interesting text book and laced samples on request.

Flexible Steel Lacing Co.
4639 Lexington St., Chicago, Ill.
In England at 135 Finsbury Pavement, London, E. C., 2.





Note how double angle supported floats are fastened to hub.

Why Take Chances

on having your exhaust system shut down indefinitely while waiting for a new fan-wheel to arrive, in case of a broken float, when you can get a fan with individual, easily replaceable floats?

Bayley

Type "B" Exhaust Fans

reduce breakdown troubles to the lowest possible minimum. They have a perfectly balanced machined steel hub, and the double-angle-supported floats are riveted to this, (not cast in, as in ordinary fan-wheels). This assures perfect balance, and makes it easy to replace a damaged float without shutting down until a new wheel can be procured.

Bayley Engineers

have made a life study of shavings exhaust, ash conveying, forced draft and ventilating problems. Their services are yours for the asking.

Ask Today

BAYLEY MFG. CO.
Dept. P Milwaukee, Wis.



Type "B" Fans are made either in single or duplex formation, with outlets in any desired direction.



Digitized by Google

(*Continued from page 46*)

room both skid platform and load are picked up by a hand lift truck as usual, and the paper isn't even touched. As the paper leaves the Sizing Cutter it is placed directly on skid platforms, picked up by a hand lift truck without rehandling and hauled to the packaging room.

In the packaging room the paper is wrapped or boxed, labeled, and as each package or box is finished it is placed on a conveniently placed skid platform instead of on the floor. When a skid platform has been completely filled it is quickly picked up without any rehandling of the load, hauled to, and deposited in the packing room. Here, the paper is packed directly from the skid platforms into crates, which also are mounted on skid platforms. When a crate has been filled it is nailed up, a hand lift truck picks up both crate and skid platform, and the crate is hauled directly into the car at the shipping platform.

Every day in this paper manufacturing plant the hand lift truck and skid platform system eliminates the hundreds of rehandling operations which manual handling would involve. No figures as to the actual saving effected are available at this moment; but it is safe to say that thousands of dollars are saved each year. Pay roll expense is greatly reduced, time is saved, and losses due to soiled and damaged stock are kept down to rock-bottom.

The many economies of the hand lift truck and skid system can be briefly summed up as follows: It Saves Time and Labor; one man and a hand lift truck often replace three or four men. Manual handling, involving repeated loading, unloading, stacking and restacking operations is practically eliminated. Materials are moved quicker and more promptly and turnover is increased.

It Reduces Equipment Investment—one hand lift truck and a dozen inexpensive skids often replace as many as twelve ordinary factory trucks.

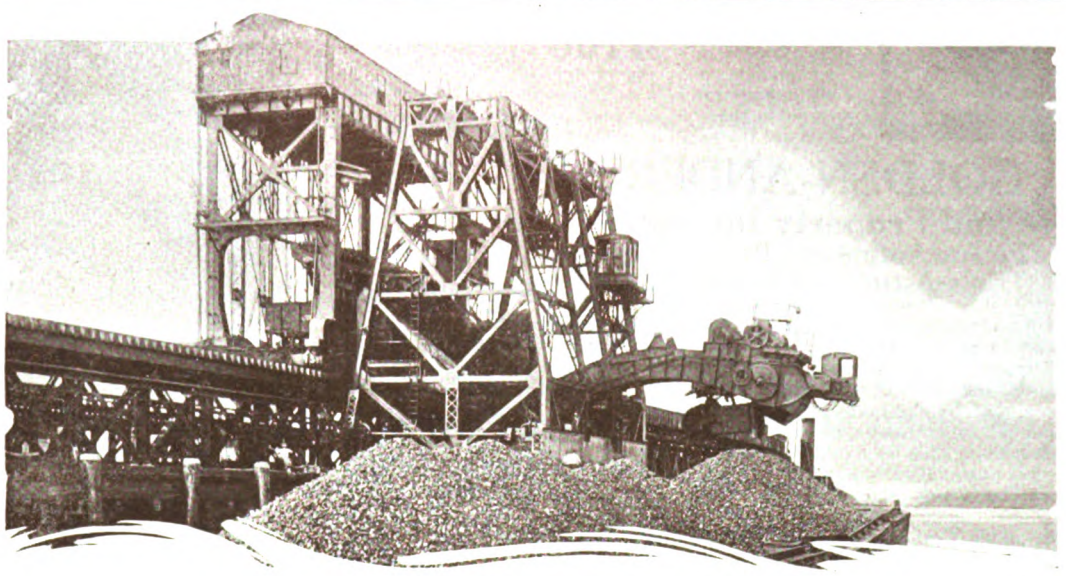
It Saves in Maintenance—only a few trucks to maintain instead of many. The maintenance of the newest type of skid with non-wearing metal legs is practically negligible.

Saves Materials and Product—by practically eliminating manual handling during transfers, it greatly reduces breakage and soilage.

It Saves Space—by providing a means for orderly and systematic arrangement of materials on the factory floor and in storage.

The worth while economies of the hand lift truck and skid system are known to many, but there are hundreds of manufacturing plants and other establishments where antiquated material handling methods are still wasting money that could be transferred to the profit side of the ledger. Look into your material handling methods carefully. Even if you are a lift truck user now, possibly present economies could be extended. Through the use of simple but ingenious skid rigs you may be able to adapt your hand lift trucks to the handling of materials heretofore considered unadapted to this system. Just now many lift truck users are finding that they can further extend the economies of their hand lift trucks by using them as trailers for long hauls, in conjunction with electric lift trucks or industrial tractors.

SKF



Greater Loads and Higher Speeds with Ball Bearing Equipped Cranes or Conveyors

THE modern gigantic crane or conveyor capable of easily and quickly handling loads of several hundred tons at a time and large volumes of materials, typifies the very rapid strides made in engineering development. In fact, the passing of only a decade finds these machines superceding the simple hand-driven devices with their correspondingly simple problem of bearing support.

But now that enormous loads and higher speeds must be dealt with, the most important consideration in obtaining mechanical efficiency and economical operation is the bearings. In this respect, **SKF** marked ball bearings are proving their pre-eminence. They nullify destructive friction almost to the vanishing point, save wasted power, and require very little oil. Their restricted dimensions fit them into confined positions, even where specific pressure is high and apt to impair bearings of any other type.

SKF marked ball bearings are likewise successful in practically all types and classes of machinery.

THE SKAYEF BALL BEARING COMPANY

Supervised by **SKF** INDUSTRIES, INC., 165 Broadway, New York City

823



Normal View *Deflected View*

BALL BEARINGS
The Highest Expression of the Bearing Principle

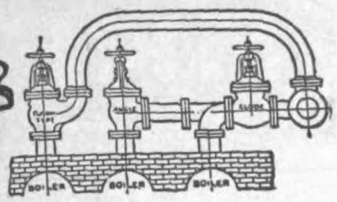
Digitized by Google



DOUBLE
EXTRA
HEAVY
Valves

"Every Valve Sold With a Positive "Guarantee."
"Hosts of References."

"The Heaviest Valve Made"



4100

Golden-Anderson Life and Property Insurance Valves are used in the iron and steel industry. Their repeat orders are the result of assured protection.

GOLDEN-ANDERSON
"Life and Property Insurance Valves"
Patent Automatic Double-Cushioned
Triple-Acting and Non-Return Valves

1. They will automatically cut a damaged boiler out of service—making it impossible for live steam to pour back into it and cause a disastrous explosion. The other boilers are left intact, and can be continued in operation.
2. They will automatically shut off the steam flow from all boilers the moment that a pipe ruptures, thereby eliminating a pipe explosion.
3. A fresh boiler is automatically cut into the line eliminating the serious danger involved when doing this by hand.
4. The pressure is automatically equalized between all boilers.
5. No. steam can be turned into a cold water boiler, thus protecting men working inside.
6. Fitted with double Corliss dashpot which insures perfect cushioning in opening and closing.
7. No pounding, sticking or spinning.
8. The only valves that can be tested in service.

Golden-Anderson

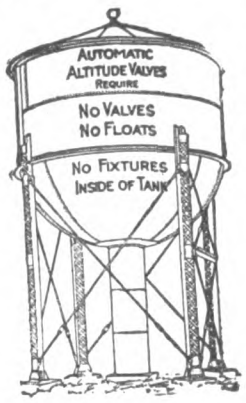
Automatic Cushioned Controlling Altitude Valves



For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. Three Ways of Closing "These Valves."

1st—Automatically by Water.
2nd—By Electricity, if desired.
3rd—By Hand.

May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.

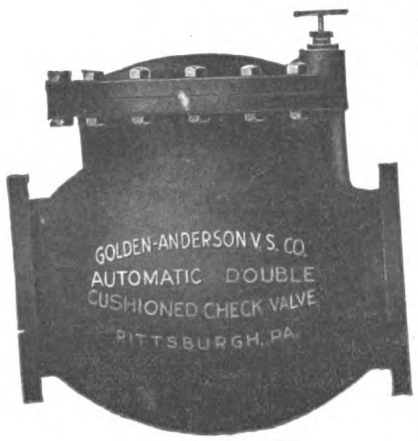


GOLDEN ANDERSON
Patent Automatic Double Cushioned Check Valve

1. Perfectly control the reverse flow of water in case pump stops to eliminate water hammer or shock.
2. Can be adjusted to operate either quickly or slowly.
3. Especially adopted for irrigation systems, water works, etc., having disastrous reverse flow of pressures.
4. Perfect cushioning obtained by water in opening and closing.

Sizes to 30" Angle or Globe Pattern.

Especially adapted for Hydraulic Elevator Service



Golden-Anderson Valve Specialty Co.
1306 Fulton Building Pittsburgh, Pa.



Our cover picture for this month shows the world's largest steamship taking on fuel oil through a ten-inch hose. Just as a matter of contrast, we are showing here what was common practise not many years ago—and still is common practise in many parts of the world—a swarm of huskies, of both sexes, transferring coal by the basketful from barges to ship's bunkers.

The Direct Route from Fuel to Power

(Continued from Page 11)

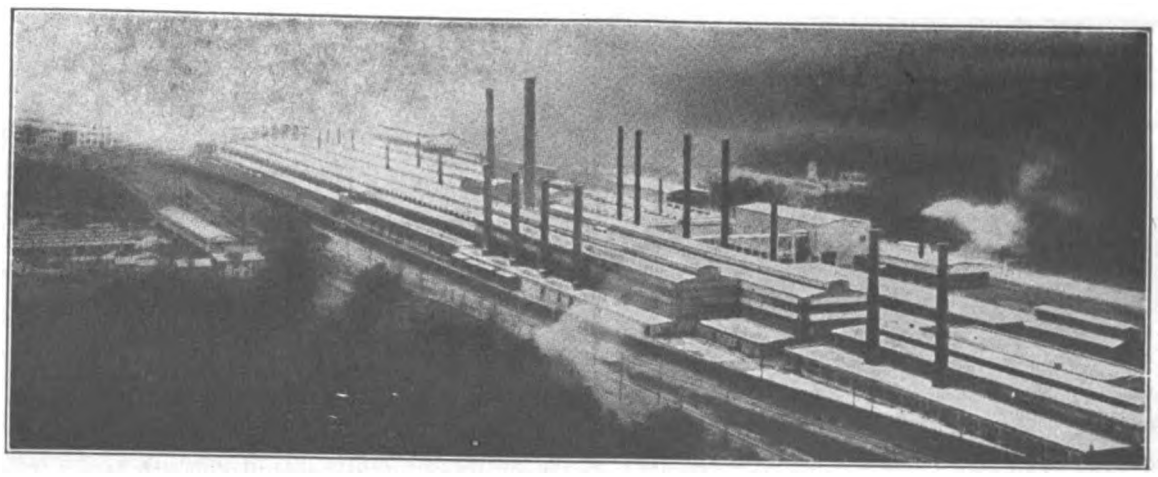
name of semi-Diesel. This term is rather confusing as it does not mean any specific type nor any specific fuel. The term has been used for various reasons, partly, perhaps, because the Diesel engine has been called the most efficient and economical producer of power. Much confusion has been the outcome of this rather suggestive term.

Internal combustion engines may be easily classified according to the fuel used. The internal combustion engine using gasoline as a fuel, a type used in the automobile, is very well known to everyone at the present time. Very often some type of this engine is used in the power plant where there is a high load for a short period of time. In other words, this type of engine is used for "stand-by" purposes. The cost of operation is high but the first cost is very low. For this reason it is advantageous where amounts up to 200 H. P. are required for an hour or so per day, or where it is necessary to have an engine of this size for stand-by purposes.

The oldest type of internal combustion oil engine was the carburating type, followed by the hot-bulb engine. This latter engine operates on an entirely different principle from that of the gasoline engine. To ignite the fuel, in the gasoline engine an electric spark is used; in the Hornsby-Akroyd engine there is no electrical device. Fuel is injected directly on the hot bulb; the heat of the bulb "cracks" the oil into

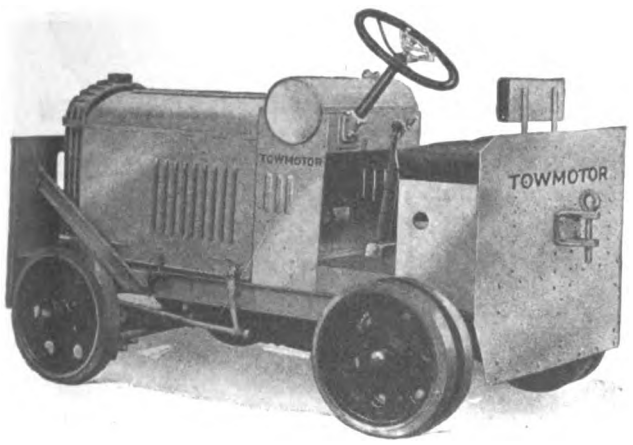
(Continued on Page 52)

Digitized by Google



THE CHASE METAL WORKS, WATERBURY, CONNECTICUT

Operate some seventy or more tractors and this is what they say about the TOWMOTOR;



"We selected the Towmotor after a very careful survey of the different types of gasoline tractors, but not from a questio.n of firs cost We felt, however that the Towmotor was a high grade machine, built along much heavier lines than some of the others and therefore better adapted to our work, and that in the end it would prove the better investment. From our experience so far, we do not feel that we made any mistake in selecting this machine."

After using ONE TOWMOTOR three months, the Chase Metal Works purchased FOUR MORE.

WHY?

Because the TOWMOTOR gives the greatest value at the lowest ultimate cost.

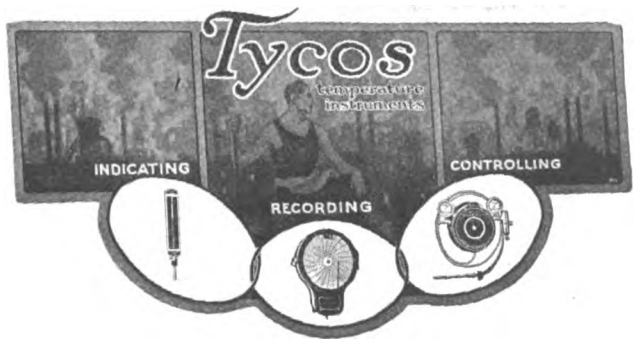
Descriptive literature and detail information upon request.

THE TOWMOTOR COMPANY

1226 East 152nd Street **Cleveland, Ohio**



Digitized by Google



PHILOSOPHY OF ACHIEVEMENT

All men are creative to a certain extent but altho' they can create they have not achieved success until they add to the comfort and well being of humanity.

A man may whittle match sticks into chains. He then created something but has not achieved a success. One day he whittles a few sticks into chairs and tables and sells them to his neighbors. Chairs and tables that stand up under heavy strains and last for many years. They are noted not only for their pleasing appearance but also their ruggedness. They are a benefit to the community and every user is pleased with this man's product. Then this man has achieved success.

Tycos

Temperature Instruments

are achievements of accuracy and ruggedness that result from over seventy years of Thermometer making. Users of *Tycos* Temperature Instruments are found all over the world in all branches of industry. Wherever temperature enters in, *Tycos* Temperature Instruments will be found doing their duty of either indicating, recording, or controlling.

If you have temperature problems in your industry, a glance through our catalog may help you solve them. The exhaustive catalog will be forwarded to you if you state your firm connection.

Taylor Instrument Companies
Rochester, N.Y., U.S.A.

Theres a *Tycos* and *Taylor* temperature instrument for every purpose.

2427

(*Continued from Page 50*)

light hydro carbons which later are burned by the heat of compression, that is, the hot bulb vaporizes the fuel.

The temperature produced by approximately 90 to 150 lb compression is sufficient to ignite the vapor.

This type engine has gone through a period of development, from hot bulb to hot plate, to hot point, and finally it has reached what might be called a separate combustion chamber. The last-named type of combustion is that which is used by the present Fairbanks-Morse engine. It will be noted that with this construction there is a large cavity in the cylinder head with a small opening which acts as a port of communication between the cavity and the engine cylinder. The oil is sprayed in at the side of the chamber. The restricted opening into the combustion chamber is so small that the gases in the chamber are not removed by the scavanging air. When the fuel is injected into the combustion chamber approximately 20 to 40 degrees before dead center, the temperature of the uncooled chamber is sufficient to vaporize the oil. As the piston approaches top dead center the air in the cylinder, due to the compression, is forced into the combustion chamber and uniting with the oil vapor, results in combustion. In this type of engine the clearance is very small and therefore all the combustion occurs in the chamber. The hot gases, due to the burning of the oil, pass through the narrow opening and act directly on the piston.

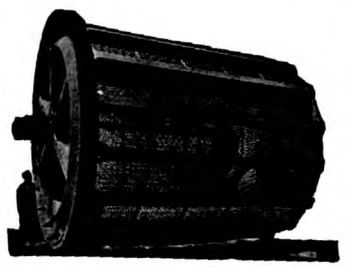
This engine, because of its operating principle, has certain limitations as to the type of fuel used. It has been found that the lighter oils give better results than the heavier oils. The line of demarkation is extremely hard to state for the various types but experts generally assume that this type of engine will not successfully operate on oils of less than 24 degrees Baumé. This limitation is reflected in the operating cost, as the lighter fuel oils cost more than the heavier fuel oils.

The so-called semi-Diesel engine is built by various firms from approximately 5 H. P. to 200 H. P. This type of oil

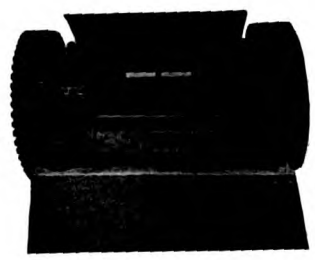
(*Continued on Page 54*)

PUZZLING
Reduction Problems Occur in Almost Every Industry

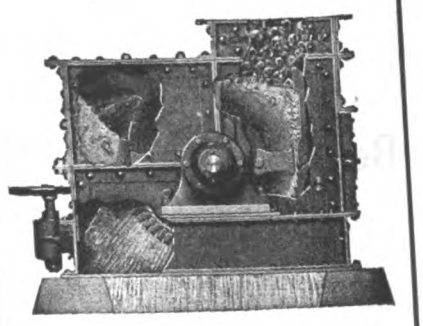
"Pennsylvania" Crushing and Pulverizing equipment has been specialized for crushing and cleaning Bituminous Coal for Power, Gas and Coking purposes, and for the primary, secondary and fine crushing of Cement Rock, Limestone, Gypsum, Ores, Sinters, Chemicals and other Materials of similar structure and hardness.



"Pennsylvania" Patented Bradford Coal Breaker and Cleaner for Coal Mines, By-Product Coke Plants, Central Stations and Gas Works.



"Pennsylvania" Single Roll Crusher for Industrial Power Plants, Gas Works and Coal Mines, in tonnages 10 to 500 tons hourly. (Patented.)



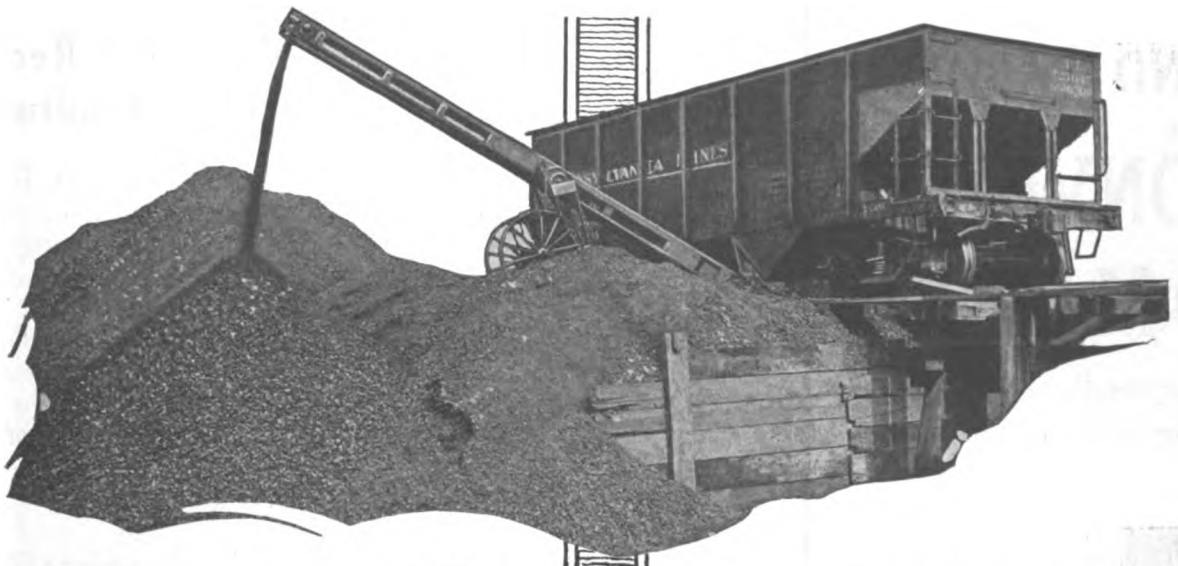
"Pennsylvania" Hammer Crusher for the fine reduction of Limestone, Cement Rock, Oyster Shells, and similar materials. (Patented.)

"Pennsylvania" Crushing and Pulverizing Machinery is distinguished by powerful steel construction, liberal proportions and thorough tramp iron protection, and is specialized for continuously delivering the specified quantity and quality of product in each class of service attempted.

Put your knotty reduction problems up to us.

PENNSYLVANIA CRUSHER COMPANY
Stephen Girard Building, PHILADELPHIA
NEW YORK PITTSBURGH

Digitized by Google



THE SCOOP CONVEYOR

Saves Time and Money Unloading Cars and Loading Trucks

FIFTY ton cars are unloaded in 1 1/2 to 3 hours by two men and the Scoop conveyor. No pit or track hopper is necessary and cars can be unloaded at any point along the track.

Five ton trucks are loaded in from 8 to 12 minutes without expensive, backbreaking laborious hand shoveling.

Costs have been cut from an average of $18 per car to $2 per car (a saving of 89%) by thousands of Scoop Conveyor users.

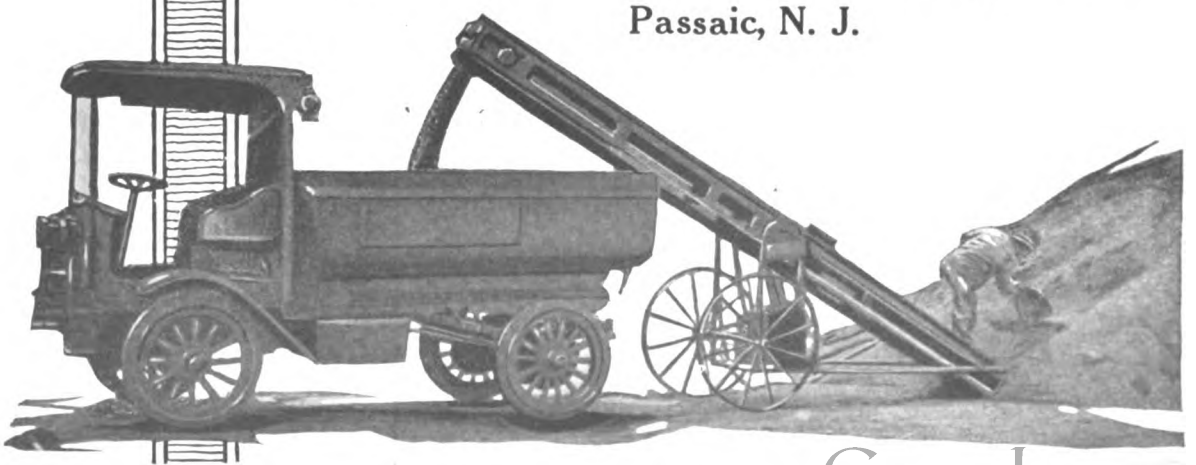
Truck loading costs have been reduced 82%—to say nothing of the time saved on this kind of equipment.

Our present product is the result of our years of experience in the design, manufacture, installation and maintenance of thousands of portable belt conveyors. It is a complete answer to conveying problems at thousands of plants and its first and operating cost is but a fraction of the cost of a more elaborate but no more capable conveying system.

Write for Catalog No. 63

Portable Machinery Co.

Passaic, N. J.



askanyuser

PORTABLE MACHINERY CO. PASSAIC, N.J. U.S.A.

Digitized by Google

SAVE TIME AND LABOR

Use The

MERRICK CONVEYOR WEIGHTOMETER

Any material which is conveyor handled can be weighed without additional handling or loss of time by the Merrick Weightometer.

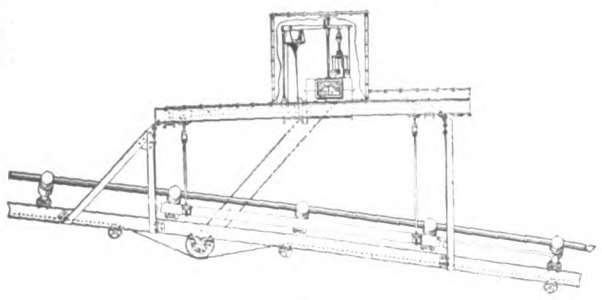


Hundreds in use weighing all classes of materials such as

coal, run o'mine and crushed.
Coke
Stone, coarse and fine.
Gravel.
Sand.
Cement Rock.
Cement Clinker.
Metallic Ore.
Phosphate Rock.
Phosphate Pebbles.
Wood Chips.
Sulphite Pulp slabs.
Fish and Fish Products
Finished Cement
Zinc Ore,
Iron Ore.
Copper Ore.
Lead Ore.
Gold Ore.
Silver Ore

TYPICAL INSTALLATION MERRICK WEIGHTOMETER

NO WEIGHMAN OR ATTENDANT REQUIRED
GUARANTEED AND PROVEN
99% ACCURATE



Method of Installation

Why rely on Bill of Lading Weights?
Why not be able to tell exactly how much material you receive?
Hundreds of concerns buy and sell their products using Merrick Weightometer weights.

For Information Write

MERRICK SCALE MFG. CO.,

180 Autumn Street **PASSAIC, N. J.**

(*Continued from Page 52*)

engine is used in a large number of cotton gins, elevators, flour mills, factories; where it either drives by belt or is direct-connected to the apparatus driven, such as an air compressor, an ice machine, a pump of any variety or similar unit. The engine has proven very satisfactory, and is used extensively where a small amount of power is required intermittently. The cost of operation is more than that of a Diesel, as the fuel economy and lubricating economy and maintenance economy are higher. However, the semi-Diesel engine, like the Ford, is so simple that nearly anyone can operate it; it does not require a very good mechanic and usually needs very little attention. Where the engine is required to produce a highly fluctuating amount of power, or where power is required without cessation day in and day out throughout the twenty-four hours, neither the gasoline nor the semi-Diesel oil engine can compete very well with steam. When we reach these requirements, or the requirement of higher horsepower than, say, two hundred or more, steam has but one rival—the Diesel engine.

The Diesel engine is the most recent development in the internal combustion field. The efficiencies and economies of a Diesel engine are in marked contrast to those of the various other types of internal combustion engines and also to the steam power plant. The field for the Diesel engine lies in the larger sized unit of from 150 to 2000 horsepower. Since the Diesel engine, however, has been the subject of much controversy, and since its development in recent years has been so extraordinarily swift, we will devote an entire article to this important engine in the December number of *Industry Illustrated*—telling wherein the Diesel differs from other oil engines, showing how it operates, and both showing and telling some of its performances in the industrial power field.

Making a Record if No Handiwork

Counters put new life into the machine operator's job by supplying the missing pride-of-craft.

When the workman is making no product of his hand and heart, he's at least making a *record* that reflects his skill and accomplishment.

He's building for a bigger, better-paying day's work—seeing it recorded on a

Veeder COUNTER

where recognition will be sure and reward equally assured.



The above Revolution Set-Back Counter records the output of any machine where a shaft-revolution indicates an operation. Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figure-wheels, as illustrated, $10.00—subject to discount. *Cut less than one-half size.* Set-Back Rotary Ratchet Counter, to record reciprocating movements as on punch presses, $11.50 (list). Smaller counters at prices from $2.00 up.

This small Rotary Ratchet Counter (No. 6) counts reciprocating movements of the lever, as required in recording the output of many small machines. When the lever is moved through an angle of 40 to 60 degrees, the counter registers one. A complete revolution of the lever registers ten. This counter is adapted to no end of counting purposes, simply by regulating the throw of the lever. Price, $2.00. (*Cut nearly half size.*) Small *Revolution* Counter, to record revolutions of shaft, also $2.



Write us about that counting problem of yours—there's a Veeder just made for it, and fully described in the free Veeder booklet.

The Veeder Mfg. Co.,
63 Sargeant St., Hartford, Conn.

Digitized by Google



With the Strength of the Pyramids

Just as the pyramids stand as gigantic tributes to the majesty of dead Pharaohs, the modern industrial or domestic buildings roofed with Bonanza "Cementile" represent the climax of scientific roofing in our day.

The roof of any building must stand the brunt of the continual struggle against destruction which wind, rain, sun, and fire wage against man's handiwork. To be truly efficient and economical the roof must resist these successfully, day after day, year after year, without necessity for upkeep work and repairs. Bonanza "Cementile" roofs fill these requirements, and like monolithic concrete grow harder, stronger, with passage of time.

Let Bonanza "Cementile" Roofing protect your buildings —it has the strength of the pyramids.

Send for catalog

BONANZA CEMENTILE

American Cement Tile Manufacturing Co.

831 Oliver Building, Pittsburgh, Pa.

PLANTS: Wampum, Pa. Lincoln, N. J. · Birmingham, Ala.

OFFICES: Pittsburgh · New York · Philadelphia · Cleveland · Birmingham

Bonanza "Cementile" is a re-inforced cement tile roofing, with a pleasing outer surface, laid directly on the roof purlins. It is light, but very strong in structure, and absolutely fireproof and waterproof. Made for flat or pitched roofs, new or old.

CEMENTILE

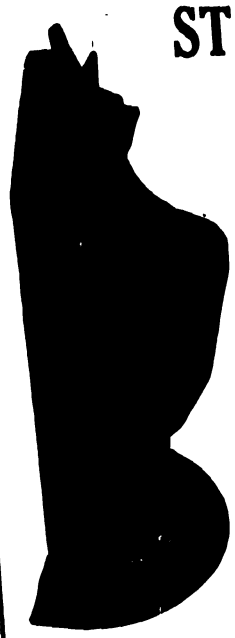
The first cost of a Bonanza "Cementile" Roof is the last cost. We make and lay the roof, and unqualifiedly guarantee the material and labor



Digitized by Google

G.P.&F. Service **Specialize in**

STAMPINGS and SHEET METAL PARTS



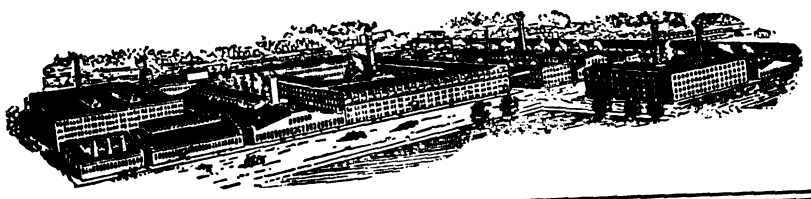
If you are using aluminum, grey iron or malleable castings or wooden parts—no matter how intricate—let us prove how we can save you considerable money by developing them into stampings or pressed metal parts.

The strength and utility of each part is greatly increased. A good deal of the expense of machining and fitting is eliminated and the stamping is accurate and uniform at all times.

Send us blue prints or samples for estimates.

STAMPING - - FORMING
DRAWING - - PUNCHING
PRESSING - - SPINNING
IN
STEEL - - COPPER
ALUMINUM - - ZINC
BRASS - - TIN

GEUDER PAESCHKE & FREY CO.
1300-1800 CANAL ST., MILWAUKEE, WIS.
DETROIT OFFICE: 712 DIME BANK BUILDING
CHICAGO: 352-358 WEST OHIO STREET



MARBLELOID

The Universal FLOORING for Modern Buildings



A STANDARDIZED lightweight composition flooring, manufactured and installed by our organization and guaranteed without restriction by us. Laid plastic, sets in a few hours into a seamless, smooth surfaced floor, good for a life-time of service.

Used extensively in Industrial buildings for Offices, Laboratories, Hospitals, Restaurants Cafeterias, Welfare Rooms, Workrooms, Toilet and Locker Rooms, Display Rooms, etc.

Fireproof. Resilient. Non-abrasive. Non-slipping. Does not require expensive upkeep and can be laid upon old or new wood or concrete floors.

The Coupon below will bring you the detailed advantages and cost of installing Marbleloid Floors in your new building or for resurfacing your old floor.

THE MARBLELOID COMPANY
467 Eighth Avenue, New York

THE MARBLELOID COMPANY, New York City: Without obligating myself in any way, please submit tentative estimates on the cost of your product installed complete for our building.....; below are the approximate areas involved.
Floor.....Sq. Ft. Sanitary Base.....Lineal Ft.
Wainscot.....Sq. Ft. I have checked the floor troubles we now have.

Our floors are
[ ] New Concrete [ ] Cement Finish [ ] Wood
[ ] Cracking [ ] Dusting [ ] Noisy
[ ] Cold [ ] Splintering [ ] Rough
[ ] Slippery [ ] Unsanitary [ ] Rotting

Name .....
Firm .....
Address.....
[ ] Please send 32 page Illustrated Booklet

The Early History of Iron and Steel

(*Continued from Page 13*)

Egyptians did it more than a thousand years before.

Both the Greeks and Romans used far more bronze than iron. Iron, or rather steel, was employed principally for edged, or pointed, tools and weapons. The defensive armor was still mostly of bronze. This distinction remained substantially true throughout the whole period of the western Roman Empire.

After the downfall of Rome, much of the knowledge of iron smelting was temporarily forgotten. Even such a thing as the stack furnace went out of use, and had to be reinvented in the 13th Century.

The darkest ages of Europe were, however, the most brilliant ones of the Mohammedan regime. The Moslems seemed to have preserved more of the ancient civilization than did the northern barbarians.

By the time of the Crusades, Mohammedan steel, including especially the Damascus and Toledo blades, had become famous. That of Damascus was perhaps due to its close touch with India, while the fame of Spanish steel was in part the result of the Catalan forge.

In such forges, which were always located near mountain streams, a rivulet of water was let to run down a pipe carrying air with it, which escaped through a hole in the pipe underneath the furnace, and acted as a gentle but steady blast.

This was probably the most effective forge until the reinvention of the stack furnace about 1200 A. D.

The great demand for armor as well as weapons during the Crusades, gave a strong impetus to the working of iron and steel. In fact the steel of the period has never been surpassed, unless perhaps by some of the recent chemical products.

A really epoch making improvement was the application of water power to working the bellows. This must have taken place as early as the 14th Century, for there are pictures, of about the year 1400, illustrating the method employed.

Better Business Systems
KARDEX
TONAWANDA, N.Y. BRANCHES EVERYWHERE

This Issue of

Industry Illustrated

is Typical of the Broad, Interesting and Helpful Service it is Constantly Rendering.

ONLY the service is continually getting broader, more interesting and helpful.

Wonderful as has been the array of timely articles and illustrations it has been presenting to its readers right along, from the very beginning, it is only beginning to scratch the surface of of the immense possibilities that lie in the power of the camera to catch for the busy man vitally important and usefulinformation that he would otherwise pass by.

Great things are coming. You will not want to miss them, even if, by any chance, you might think you can afford to miss them.

If you are already a subscriber, see to it that your subscription is renewed promptly. If you are not now on our lists for your own personal copy, put yourself there at once. See this coupon below?

Mail this Coupon TODAY

Industry Illustrated
120 West 32nd St., New York, N. Y.

Send me a copy of Industry Illustrated every month for a year. I shall remit on receipt of your bill—in the next 30 days or so. (If a renewal of a present subscription, check here.....)

Name.....
Address.....
Company..... Title.....

Annual Subscription Price, $1
In Canada, $1.25; Foreign, $1.50

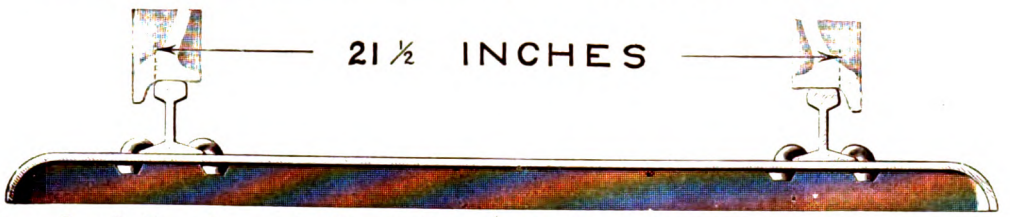
(AD-L)

Digitized by Google

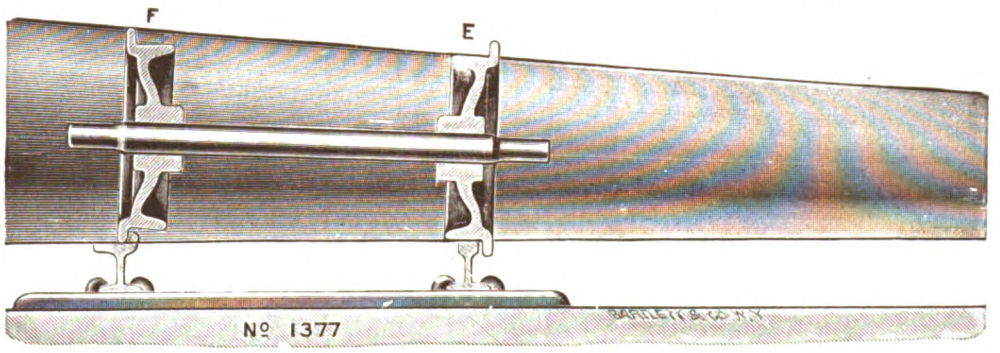
HUNT INDUSTRIAL TRACK AND EQUIPMENT

is constructed for every industry and service where the movement of material is essential. ***One man*** can push a ***one ton load*** on a ***Hunt System*** around 12-ft. Radius Curves and Switches as Easily as on Straight Track. The ***secret*** of this Easy Running is in the Construction of the Running Gear, Curves and Switches.

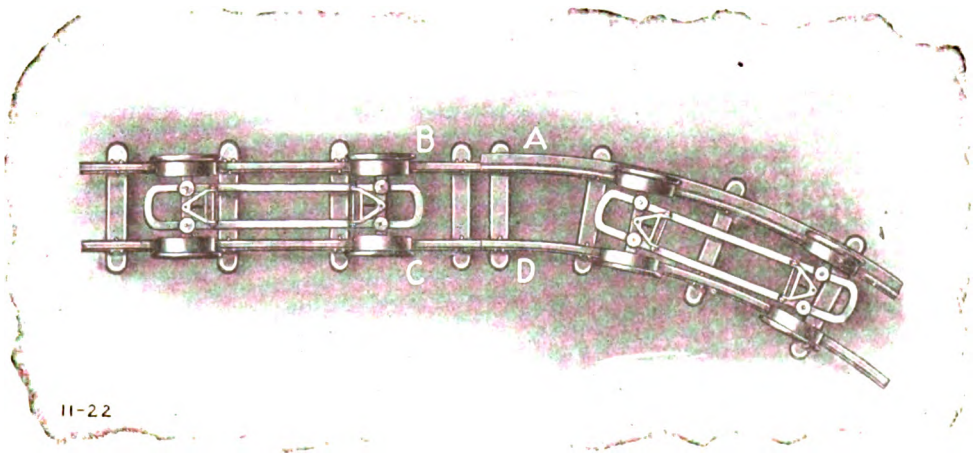
The Gauge of track is 21½ inches, measured from outside to outside of railheads, with the flanges of wheels running on the outside, as illustrated below.



Standard Section of Hunt Track-Rails are Hot Riveted to Ties



Section showing the theoretical cone and circular path assumed by Hunt axle and wheels in rounding a curve. Note that flange of outer wheel rides on special guard rail and tread of inner wheel rides on head of tee rail the same as on straight track, thus forming the cone.



Hunt flexible wheel base showing position of wheels on the straight track and the radial position assumed on the curve

The action of the axles and wheel flanges on Hunt cars in rounding curves is illustrated above. As the car on a straight track approaches the curve, the wheel (B) runs on its flange on the special outer curve rail (A) and the wheel (C) runs on its tread on the inner rail (D). Thus as the axle assumes a radial position there is no slipping on the rails and no sliding friction.

C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, NEW YORK

New York Office, 143 Liberty Street

Ernest F. Learned
141 Milk St., Boston 9, Mass.

Philips, Lang & Co., Inc.
538 So. Dearborn St., Chicago, Ill.

Digitized by Google

Would You Buy a Trap That MAKES Condensate?

Judging by the size of many steam traps, they were made to *promote* condensation rather than to take care of it. Traps of the "bucket" and "float" types in particular become regular steam condensers by reason of their great internal area and the large volume of water they hold. Both of these factors cause the formation of *extra condensate!*

This waste of heat units—and remember, *heat units mean coal*—is positively prevented by the use of

STEAM TRAP SARCO

Small in size, and having neither steam dome nor reservoir, the Sarco offers no opportunity for a lot of condensate to form. No chilling walls, no big body of water to reduce *the steam in the trap* to liquid.

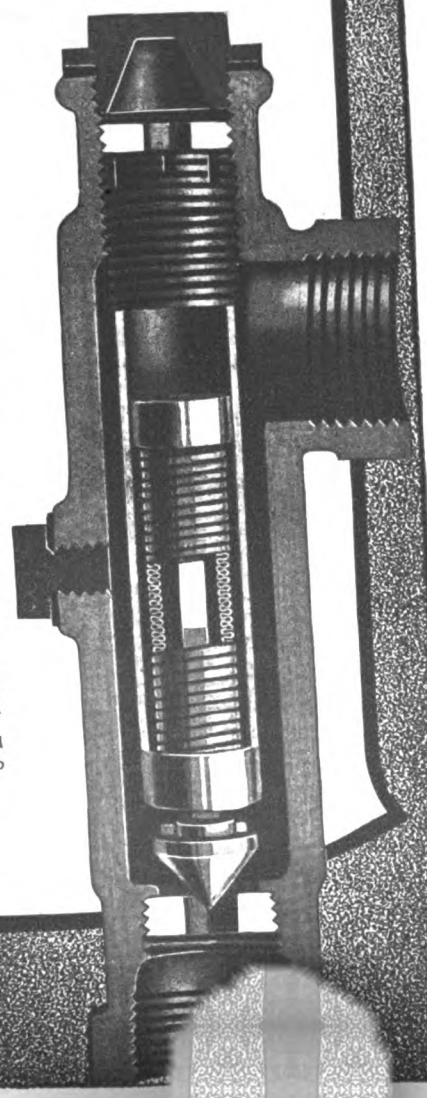
As soon as a little water collects, the Sarco opens promptly and drains off the condensate. All the steam from the lines above passes on. No part of it remains in the form of condensate, to surrender its heat. No live steam can escape.

Don't use steam traps that deliberately rob you of heat units. Install the scientifically constructed Sarco. It is a valuable conserver of coal.

The Steam Trap Sarco costs only one-third as much as high-priced expensive-to-maintain traps. And the cost of installing is nil. For it can be quickly screwed into the pipe line at any angle. No need to dig a pit nor build a platform.

Let us send you a Sarco on 30 days free trial.

There's Steam Trap information in our Sarco Book, R-21. Write for a copy today.



SARCO CO., Inc.
236 Broadway New York

Buffalo Cleveland
Detroit Chicago
Philadelphia

Lilliputian Mines and Factories in the U. S. National Museum

(*Continued from Page 22*)

you can peer through windows into the heart of the hill which this "drift" mine penetrates and see the electric locomotive pulling its train of coal cars. This exhibit covers no less than 1,500 square feet of floor space. Near at hand is a model showing a coal mine of another type—a shaft mine—and in this case the underground workings are displayed in great detail, with miners cutting coal by machinery, mule-drawn trains of mine cars, and all the other essential features of this subterranean industry.

A model of striking scenic interest illustrates the occurrence, mining and treatment of rock salt for the manufacture of sodium compounds. It represents a narrow strip of country lying between the Tully Lakes region of New York State, where the salt wells are situated, and the village of Solvay, a suburb of Syracuse. Here we see one of the Tully Lakes, which supplies water to the salt wells, a few of the brine wells, a limestone quarry, the product of which is used in the soda works, an outlying portion of Syracuse, and the soda works at Solvay. Real water runs from the lake, forming a stream which flows the whole length of the model.

Elsewhere we see models of glass-melting furnaces, illuminated from within to represent them in full blast. Both the standard types are shown; the tank furnace, used when large quantities of products are made having the same composition; and the pot furnace, for making special glasses in small quantities. The furnaces are partly dissected, to show interior features. Numerous workmen are seen blowing glass and performing other operations of the plant.

A working model of a salt factory, with adjacent brine wells, divides honors with the big colliery in the estimation of those that like to "see the wheels go round." It is a replica of a plant near Warsaw, New York. Not only does it include busy machinery and rushing streams of water, but also animated figures of women at their sewing-machines, stitching up the bags, and workmen engaged in various other operations.

A model on the subject of gold mining is a fine example of the *multum in parvo* that can be realized by this method of visualization. Here we have a beautiful expanse of mountain country cut by a river valley and stretching away as far as the eye can see. Within this one vista we are shown all the methods of mining gold. A lone prospector is "panning" in a mountain brook; a huge dredge is combing the river bottom; powerful jets of water are breaking down a gold-bearing gravel bank; and a lode-mining project is seen in full development. One would need to travel long and far through the gold fields to see what is here beheld at a glance. Another model relating to gold shows how steam is used to thaw the frozen ground of Alaska, while a third represents a cyanide plant. There is an impressive model of the enormous Bingham Canyon copper mine, in Utah; a vast open pit, in which the mining of low-grade ore by steam-shovel has inaugurated a new era in the history of copper.

A complete white lead works; a plaster factory with a gypsum mine underneath it; carborundum furnaces before and after firing; a Portland cement plant and an idealized group of chemical installation required for the production of dyes, war gases, pharmaceuticals and explosives (recently assembled by the National Research Council) are some of the other objects of interest in this wonderfully instructive collection.

Digitized by Google

P&H CRANES and HOISTS



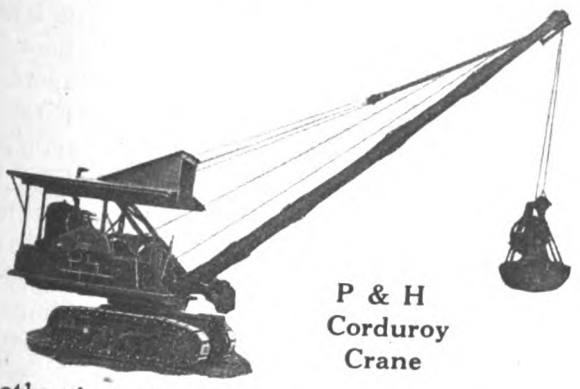
P & H
Material Hoist

Speed Up Car Unloading Prevent Railroad Car Embargoes

Since all business is inter-dependent, all will benefit through the quick release of railroad cars.

The Interstate Commerce Commission is urging the rapid unloading of all open-top cars—and this can be accomplished with P & H Material Handling Hoists and Cranes.

Between 200 and 300 tons are handled today by P & H Grab Bucket, Hoists and Monorail,—doing this at minimum cost and less labor.



P & H
Corduroy
Crane

Many other industrials are using similar equipment, and such companies as Standard Oil, Worcester Gas Light Co., Mohawk Valley Mills, Reiss Coal Co., Booth-Kelly Lumber Co., Great Northern Paper Co., Hart-Wood Lumber Co., Independent Coal & Coke Co., have put the easily maneuvered P & H Corduroy Crane to work in their yards.

This crane operated by gasoline or electric motor is a flexible, economical, one-man operated unit that requires no installation expense. With grab bucket it unloads coal, gravel, crushed stone, sand, from car to stock pile or truck at the rate of a ton a minute. With magnet it handles pig iron, scrap, and similar materials.

Complete information promptly forwarded.

PAWLING & HARNISCHFEGER CO.

Established in 1884

3850 National Ave., Milwaukee, Wis.

New York, Pittsburgh, Phoenix, Los Angeles, Portland, Chicago, Philadelphia, Denver, Salt Lake City, Atlanta, St. Louis, Birmingham, New Orleans, San Francisco, Seattle

Eveready Flashlights are indispensable in preventing accidents and fires in factories!



There's an Eveready Flashlight complete for every purpose from $1.35 up to $4.00

The factory is a place where Eveready Flashlights are an absolute necessity for the safety of life and property. Eveready's advantages are endless. Following are a few of the best—

1. **Lighted instantly** — much quicker than matches
2. **Flameless** — no fire risk
3. **Steady** — unaffected by wind or rain
4. **No wires** — no connections to make
5. **No cord** — nothing to catch in machinery
6. **Concentrated light** — a bright electric beam directly where you want it
7. **Handy to carry** — much smaller and lighter than a lantern

Indispensable in stock rooms — to read labels on barrels and boxes

For accurate measurement reading — temporary measuring devices set up in odd corners

For easy reading of counters — always convenient, often necessary

For quick repairs — often made on the spot

For the company physician — he uses specially designed flashlights for the examination of eye, ear, nose, and throat

For inspection of equipment — sprinkler heads and other appliances can hardly be thoroughly inspected without a flashlight

Where inflammable liquids and gases are — having no sparks, no flame, flashlights are recommended by the Bureau of Explosives as perfectly safe

For the night watchman — every watchman should, of course, be equipped with an Eveready Flashlight

Write to our nearest address

NATIONAL CARBON COMPANY, Inc.
Long Island City, N. Y.

Atlanta Chicago Cleveland Kansas City
San Francisco

EVEREADY FLASHLIGHTS & BATTERIES

Digitized by Google



NO REPAIRS

"PERFECTLY satisfactory and no repairs." This is the statement from the engineer in charge of the Terry Turbines installed at the Lever Bros. Co., Cambridge, Mass. The fact that Lever Bros. have as yet made no repairs is significant of the fact that Terry turbines, with the proper attention to lubrication and adjustment, are free from operating kinks and troubles and will continue to give good service during the calculated life of their wearing parts. There is no moving mechanism built which will run forever without replacing the wearing parts and the Terry turbine is no exception to this rule. And as Terry turbines were being manufactured over twenty years ago there are many which have required repairs. For this very reason, The Terry Steam Turbine Company maintains a very complete and extensive stock of repair parts ready for immediate shipment and a force of trained men in the field for the purpose of making replacements when necessary. When buying turbines one should not forget the importance of always being able to maintain them in first class condition. Specify that turbine which needs but little attention but can get attention when it needs it.

THE TERRY TURBINE

Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co. Terry Sq. Hartford, Conn. U.S.A.

T-795

The "Sport" of Saving Human Lives

(*Continued from page 23*)

ing the proper treatment to a stated injury, the participants in the contest may well think of themselves as actors in a little drama of real life.

Here is a typical problem: A small truck of the Bell Telephone Company is travelling along the highway. The men observe a farmer driving his wagon in a field. The horses becoming frightened run away and the farmer is thrown out. The four men on the truck run to the injured man's aid, finding that he has sustained a compound fracture of the right upper arm which is bleeding in spurts: the knee cap on the same side is fractured. In addition he hit his head on the hub of the wheel causing a laceration on the right side of scalp.

The team will demonstrate the first aid care and how the patient is carried back to the truck for transportation to the hospital. The patient will be carried to the side lines and back.

As each team completes its problem, its captain raises the team standard and its time is taken by the timekeeper. Completion of the problem in less than the time limit is of no advantage to the contestants; but a deduction of one point for each minute or fraction of a minute is made in the case of any team exceeding the allowance.

Other point deductions are made for improper methods of treatment. For instance, failure temporarily to control hemorrage previous to the application of a tourniquet, seven points; improper application of a tourniquet, ten points; failure to apply tourniquet, twelve points; and similar penalties running down to two points for a bandage too loose or too tight and one point for using a granny knot instead of a square knot in securing the tails of a bandage; for lack of neatness or the failure on the part of a captain to give a command properly. A perfect demonstration of a given problem is rated at 100. While each team is demonstrating its problem, the judges closely observe the treatment and upon its completion may call upon the captain or any member of the team to explain any feature of the work. This done, the deductions decided upon by the judges are made, and the scores are turned in to the chief judge. He in turn transfers them to the recorder, who tabulates and averages the results when all teams have completed all of the problems assigned.

Of the seven teams which took part in the Pittsburgh contest, four represented departments in the city itself, while three were made up from various departments in smaller cities of the Pittsburgh Division.

The final score was:

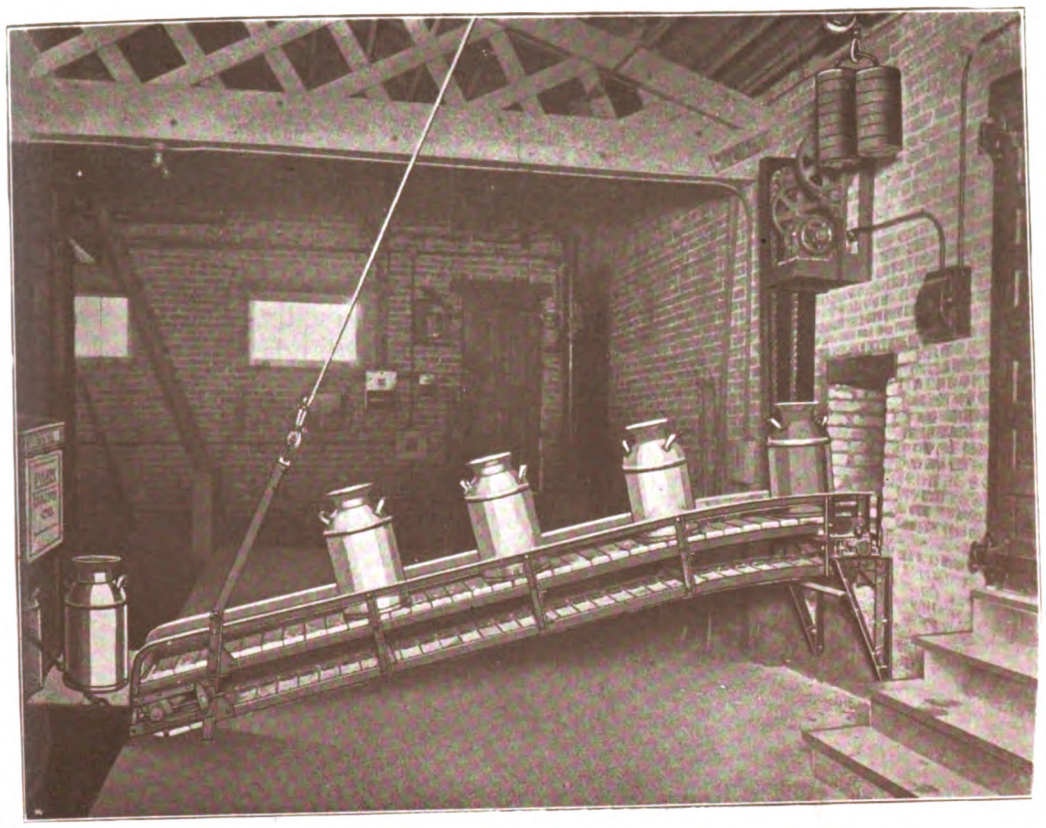
Buildings Dept.	98
Construction Dept.	95
Equip't Dept.	94 2/3
Maintenance Dept.	90 2/3
Greensburg	90
New Castle	89 2/3
Erie	86 2/3

That its exponents among the telephone people have made First Aid training a sporting event in the finest sense of the term was never more forcefully illustrated than in the splendid spirit with which, immediately after the results had been announced, the losing teams hurried across the floor to congratulate the winners.

But if Safety First work is sport for the participants, it is more than that for the supporters of the contesting teams. In Pittsburgh, at least, First Aid rooting has become a science. The telephone "gang" go about the job of letting their teams know they are behind them with very much the same enthusiasm—and some of the mechanical resourcefulness with which they attack such a problem as restoring service after a bad sleet storm. The cheer leaders gave every evidence of having profited by the presence in Pittsburgh of two large institutions of learning; but it is probable that the boys of the University of Pittsburgh and Carnegie "Tech." would acknowledge that their non-academic pupils in applied noise-making have gone them one better. Pandemonium, refined until everything but the pure essence of uproar had

(*Continued on page 62*)

Digitized by Google





What is Your Material Handling Problem?

IF you are not handling your materials mechanically you are permitting a condition to exist in your establishment which vitally effects the cost of your product. The continuance of lax methods of handling materials is unwise because production costs are so absolutely dependent upon Conveying Systems.

The economies resulting from installation illustrated is interesting. This Conveying System carries cream cans from trucks to cooling room. Previous to installation of equipment it took one hour to transfer a day's supply. With the Conveying System it takes but ten minutes. Here is an absolute saving of fifty minutes of time, to say nothing regarding saving in labor. This is a typical case of reducing costs thru installations of Conveying Systems.

It is costing you a significant amount to handle your materials. A Conveying System designed to meet your individual requirements will substantially reduce this cost and in addition to reducing handling cost will materially increase your production. Let our conveyor engineers make an analysis of your material handling problem. This costs you nothing. The analysis will undoubtedly reveal conditions that are costing you more than you ever thought possible. Put an end to this immediately by arranging an appointment so that this matter can be discussed to your entire satisfaction.

SAMUEL OLSON & CO.

Loose, Bulk and Packed MATERIAL HANDLING SYSTEMS

2418-26 Bloomingdale Ave.
CHICAGO, ILLINOIS

5th Ave. Bldg.
NEW YORK. N. Y.

Digitized by Google

First Aid to Avoiding the Friction Due to Cutting Wages

Get This



(post paid on request on your letter-head)

These plan books come in 100 lots and they are sold to employers of Labor at 25c each, any excess over cost is applied to advertising. These books are retailed at $1.00 each to individuals in retail stores, book stores, drug stores, department store book departments.

WHEN INcome is reduced—the problem of living within it is increased—Advice from the employers who have cut the income IS never thought much of by the employee.

BUT—a practical plan showing HOW to budget that reduced income—a plan based upon ACTUAL and Liveable conditions—showing how to apply "Practical Thrift" to Living and Saving—to control OUTgo and INcome, the HOW is always gratefully studied—That's what we have worked out—NOT merely a book—NOT an accountancy system—but a PLAN of Home Budgets —Direct—USABLE.

Here it is, look it over.

It's endorsed by leading Bankers—Economists and business men everywhere.

Tell us how many you care to have to give or sell to your employees.

The cost to you will be nominal. It will cover our actual cost of production and compilation and every dollar over goes into further advertising IN YOUR LOCALITY OF THIS PRACTICAL THRIFT IDEA.

Help your employees, indirectly by showing them HOW to have and SAVE and still enjoy the little things that make life more than mere existence.

Get this First Aid to thrift—this Silent Partner of the individual. Write us a frank constructive criticism and say whether you care to help along this practical way to avoid discontent due to reduced incomes among the wage earners.

The man who plans or budgets his income so that he saves something out of what he makes is a more valuable employee than the spend-thrift.

This campaign helps to make ***better satisfied*** employees through practical education.

MENTER

Teachers of THRIFT Since 1889.

"Thrift Division"

Suite 2, 1419 Seventh Ave., New York, N. Y.

While others TALK thri ***show your employees "HOW"***

(*Continued from page 60*)

been removed, reigned during the intermissions between problems. Huge bells purloined from locomotives or country schoolhouses vied with watchmen's rattles constructed on so large a scale that their clatter could be heard at least a half-mile; cowbells jangled, automobile horns honked raucously, sirens screamed.

But the remarkable thing about this feature of the contest was that the moment the chief judge had an announcement to make, he had but to raise his hand and the enormous building with its yelling crowd of three thousand wild-eyed rooters became instantly silent. Even the loud-speaking telephone amplifier was unnecessary. The speaker could have been heard perfectly without it, so far as interruptions from the crowd were concerned.

The contest cup was awarded, individual awards were presented to the winners, there was much slapping of backs and many good-natured threats of "Wait and see what we do to you next year!" and everybody filed out of the hall, tired almost to the point of themselves needing First Aid Treatment but—happy.

The Pittsburgh contest is only one of many held this year by companies associated with the Bell System. Seven out of the twenty-six organizations which make up the system have their First Aid training well enough advanced to hold successful public demonstrations this year, including elimination, semi-final and final contests, and the idea has been adopted and is being enthusiastically received by employees in other companies. It is safe to predict that within a year or two every one of the plant employees of the system—there are now some 55,000 of them—will have received intensive First Aid training. When this has been accomplished it is not improbable that teams from all parts of the country may be brought together in a nation-wide First Aid "World's Series."

The First Aid contest has been evolved by applying to the problem of Accident Prevention the apparent paradox to the effect that one of the best ways of getting an important piece of work done is to make play out of it. It is making a sport out of business—the vitally important business of saving human lives.

And right here it may be well to consider another interesting paradox. The Bell System's experience with First Aid instruction has almost completely reversed a maxim that has grown hoary with age. For it has been literally proved that an ounce of cure is worth a pound of prevention—because it *is* prevention. No more interesting fact has been developed from this nation-wide course of instruction in applying bandages, compresses, tourniquets and splints than the fact that treating purely hypothetical injuries has had the curious psychological effect of making employees far more careful in avoiding accidents. As interest in the First Aid classes has increased, the number and seriousness of accidents have decreased.

As a matter of fact, experience has shown that accident prevention and First Aid are really coördinate projects and must be undertaken together, the progress in each reacting upon and contributing to the progress in the other.

The peculiar problem of the telephone company, as far as accident prevention and First Aid training are concerned, arises from the fact that, by the very nature of things, its employees are scattered all over the four corners of its territory and must work in relatively small groups. Here is the situation: a lineman here; and installer there; a "trouble-shooter" climbing a pole upon a lonely mountain side, perhaps miles from the nearest human being; at best, a gang of a half dozen or so workmen—quite a different problem, this from that of undertaking a safety campaign in a factory or a group of factories where every employee is under the watchful eye of his supervisor; where elaborate safety appliances may be installed; where accident-prevention rules may be brought to the attention of workmen by signs and placards constantly sounding their word of warning; and where First Aid treatment may be promptly administered by the representatives of the com-

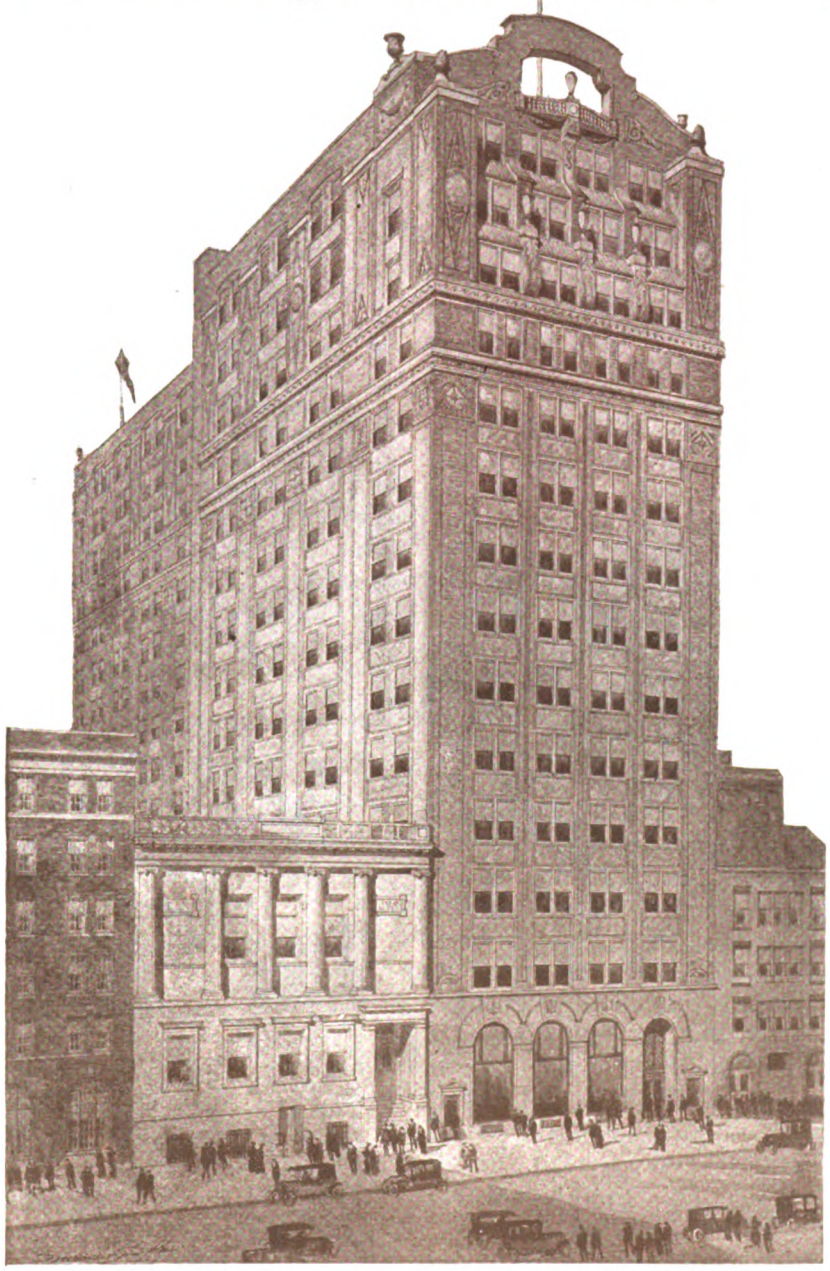
(*Continued on page 64*)

Digitized by Google

BAR BUILDING

An Office Building for Lawyers

36 W. 43rd St., Through to 37 W. 44th St., New York



Charles L. Fraser
Building Contractor
372 Lexington Ave., N.Y.

Knickerbocker Fire-proofing Company.
Floor Arches
and Concrete Works
56 West 45th Street, N.Y.

S. H. Sweeney
Heating & Ventilating
Contractor
213-215 E. 44th St., N.Y.

Fish Brick Sales Co.
Face Brick Contractors
25 W. 45th Street, N.Y.

Campbell Metal Window Co.
Metal Windows
8 West 40th Street,
New York

Severance & Van Allen ---- ***Architects***
372 Lexington Avenue, New York City.

Gurney Elevator Co.
Elevator Contractors
300 Eighth Ave., N. Y.

South Amboy Terra Cotta Co.
Terra Cotta
Contractors
150 Nassau Street, N.Y.

Hay Foundry and Iron Works
Structural Steel
15 Madison Sq., N. Y.

Farnum Plumbing Company
Plumbing Contractors
370 Lexington Ave., N.Y.

Construction and Foundation Corporation
Rock Excavating and Foundation Work
372 Lexington Ave.,
New York City

STORES and three lower floors will be open to commercial tenants. Directly connected with the House of the Bar Association which has over 2600 members. This is the first Professional Building for attorneys in New York. Space is being rapidly absorbed by prominent men of the Profession. This building will be an asset to your business. The large store and mezzanine has frontages both on 43d and 44th Streets and display along the entire course of the Arcade which connects the two Streets.

For further Information Address Burton Thompson, Managing Director

BAR BUILDING INC.,

372 Lexington Avenue, New York City

Digitized by Google

TRUSCON
STANDARD BUILDINGS



Less than $1.00 per sq. ft.
for this permanent building with steel windows and doors

The building illustrated is 64 ft. x 150 ft. with clear height of 11 ft. in side bays and 24 ft. in center bays. The price covers this modern all-steel building erected complete (except floor and foundation)—a fireproof building daylighted and ventilated by wide expanse of Truscon Steel Windows, with monitor sash mechanically operated. (Price also includes 50c freight rate.)



Many Truscon Standard Buildings cost even less than the one here illustrated—all give corresponding savings over other forms of permanent construction. Furnished in many types (some illustrated below), in any size, and with any desired arrangement. Used for widest variety of purposes including factories, warehouses, foundries, oil buildings, railroad buildings, offices, shops, also auxiliary buildings.

SAWTOOTH ROOF



PITCHED ROOF



PITCHED ROOF WITH LANTERN



Tell Us Your Problem

And we will quote you price on a building to meet your needs exactly. Write now while prices are low.

Remember you pay only our factory cost plus one overhead, plus one profit.

TRUSCON STEEL CO.
YOUNGSTOWN, OHIO

Memo to write to Truscon Steel Co., Youngstown, O., about building problem.

(*Continued from page 62*)

pany's medical department.

The telephone employee is thrown upon his own initiative. He becomes very largely the guardian of his own safety. He must, in addition, be responsible for the care of his fellow workman if the latter is injured. All of which has two beneficial results: first, in the selection of a personnel which may be trusted with these responsibilities, and second, in a continuous process of developing greater self-reliance as the employee is thrown more and more upon his own resources.

So that, although the accident prevention problem with which telephone companies are faced is quite different from that with which other industries have to deal, and is in some respects more difficult, they are more fortunate than many others in having a personnel peculiarly adapted to instruction in accident prevention measures, peculiarly apt in mastering the essentials of First Aid instruction.

It was in 1914 that the Bell Telephone Company of Pennsylvania made its big discovery as to the really vital feature of successful First Aid training. It found that it had been overlooking the sporting spirit as a means of counteracting the otherwise rather sober aspect of First Aid work. "It was believed that the lack of interest evidenced up to this time was probably due in a large measure to the fact that First Aid had to do with injury, a thing that most of us do not like to think about," declares H. L. Badger, general superintendent of plant, "and as a consequence our natural reaction is to cast it out of our mind as soon as may be. The sporting spirit was introduced to relieve this."

Here are some of the results of First Aid and accident prevention work as reflected in statistics compiled by a Bell System company which has an intensive program under way. In 1915, when this program was first undertaken, the average number of employees in the Plant Department was 3703, while in 1921 it was 4325. Despite this increase in the number of employees, the number of accidents decreased over sixty-five per cent; the number of accidents per hundred employees over fifty-seven per

MORRiS PUMPS

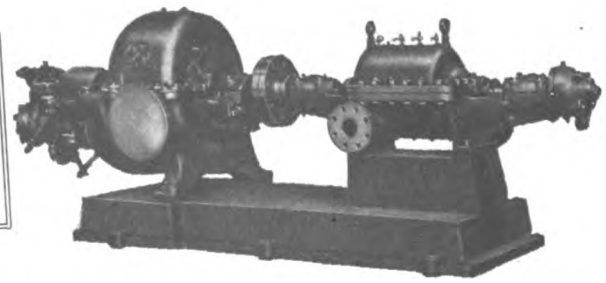
If It's a "MORRIS" It Does the Work Better!

Whether it is a matter of pumping fresh or salt water, acids or other liquids,—unscreened sewage or the products of hydraulic dredging, your pump ought to be a Morris Centrifugal.

Having built over 66 thousand centrifugal pumps of all types and sizes, in the past 58 years, we think we are justly competent to make the assertion above.

Let our engineers analyze your pumping problem to insure the selection of a pump most suitable to your requirements.

Since 1864 Builders of Dredges, Centrifugal Pumps and Steam Engines



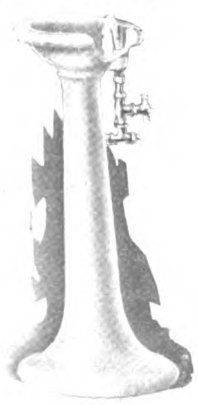
Centrifugal Turbine Driven Boiler Feed Pump

MORRIS MACHINE WORKS
200 Genesee St., Baldwinsville, NEW YORK

"VERTICO-SLANT" DRINKING FOUNTAINS



When Cool Days Come



and chilling winds necessitate the closing of windows and doors, your workers need the refreshing draught of cool, pure water to relieve the throat dryness occasioned by this shutting in.

Give them the means of quenching their thirst; but be sure they are protected against contamination by using R & S Metal Body Coolers with the *Vertico-Slant* stream, in which no bacteria can lodge.

"Lips cannot Touch nozzle"

These inexpensive coolers save water and ice, as well as the health of your workers. Learn how to save and protect. Write today.

RUNDLE-SPENCE MFG. CO.
MILWAUKEE, WIS.

Digitized by Google

cent; the number of accidents resulting in lost time over eighty per cent and the total number of days lost time eighty-six per cent. Apart from the humanitarian aspect of the matter the movement has proved its value by increasing what manufacturers would call "production."

Eloquent evidence of the fact that First Aid instruction has played no small part in bringing about such remarkable results is afforded in the experience last year of the three divisions of the Pennsylvania Company. Its First Aid courses got under way at the beginning of the year, up to which time the accident rate was increasing. When the training course got under full swing, the accidents began to decrease, the result being the first "no accident" month in the history of the Plant Department. The record of these three divisions, by months was:

	Jan.	Feb.	March
Philadelphia	2	2	0
Harrisburg	6	0	0
Pittsburg	7	2	0
Total	15	4	0

During the past year this particular company has had ninety-five per cent of its Plant Department employees, eligible to participate, enrolled in First Aid training courses, with 498 five-men teams participating in elimination contests. It is more than a coincidence that during the year it has made the following awards for "no-accident" records; one-year, 118; two-year, 170; three-year 52; four-year 54; five-year 17; and six-year, 42.

But statistics do not tell the entire story. The real value of First Aid training is demonstrated in the record, written in the day-in, day-out routine of telephone employees who have risen to emergencies and who, by applying the knowledge acquired in classroom or in contest, have alleviated suffering and saved lives.

The number of such instances is almost impossible to compute. Many of them have gone almost unrecorded, or with but brief newspaper mention. From at least one source, however, it is possible to obtain some conception of the important part which First Aid instruction plays in the life of the telephone man and, for that matter, of the telephone woman.

After the death of the late Theodore N. Vail, for many years president of the American Telephone and Telegraph Company, a memorial fund was provided by Mrs. Vail and by the company, from which are awarded annually gold, silver and bronze medals to employees of the company "for noteworthy public service." The Vail medals are not awarded merely for acts of heroism or spectacular deeds, although heroism often characterizes the services performed, nor as a reward for faithfulness in the performance of daily tasks, but rather to honor the memory of Mr. Vail by recognition of some of the most conspicuous examples of his own ideal of public service, whether performed "in the line of duty" or otherwise.

The first of these medals were awarded last year, for services performed during 1920. One gold medal, nine silver medals and fifty-eight bronze medals were presented. The services thus recognized ranged all the way from the heroism of the winner of the gold medal, who remained at her switchboard when a flood carried away a score of buildings in the village where she was the sole telephone company employee and whose warnings saved hundreds of lives, to the sense of loyalty which prompted an operator to walk four and a half miles through a blinding snowstorm in order to report for duty.

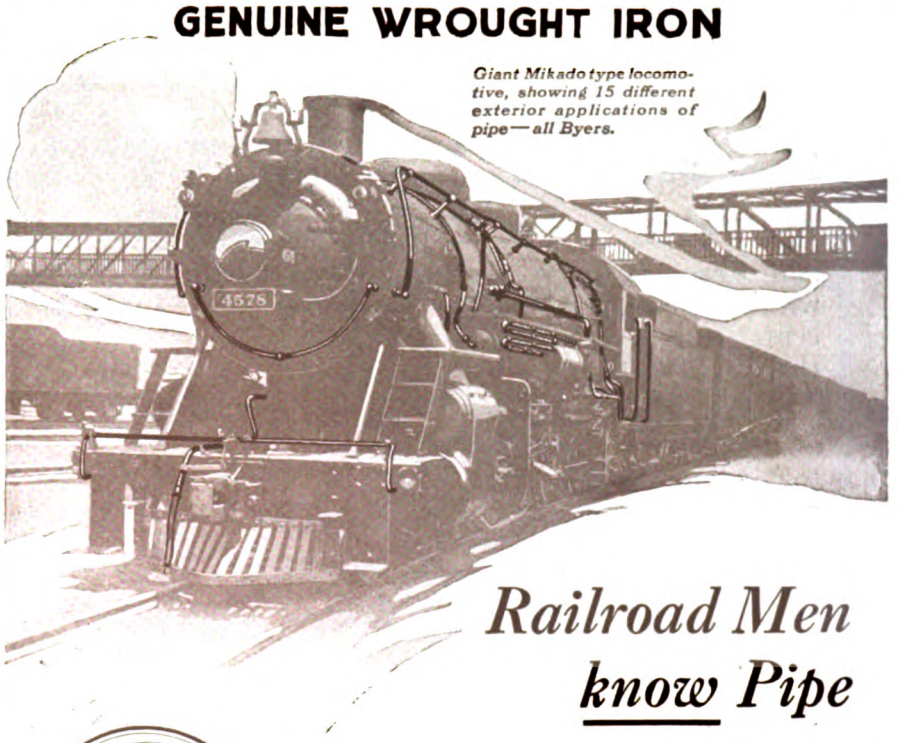
It is a noteworthy fact that well over twenty percent of these acts of public service which were rewarded by the receipt of the Vail medal involved the use, in some form, of a knowledge of First Aid methods. Three of the silver medals and twelve of the bronze medals were awarded in cases of this character.

Public service is, indeed, the very essence of the First Aid program undertaken by the tremendous organization which Mr. Vail did so much to build up—and this means much more than merely reducing the number of days lost through accidents or through lack of proper treatment of employees who are injured, and thus serving the public by promoting a higher degree of efficiency in providing it with a nation-wide system of communication.

It means the direct service of the public through knowl-

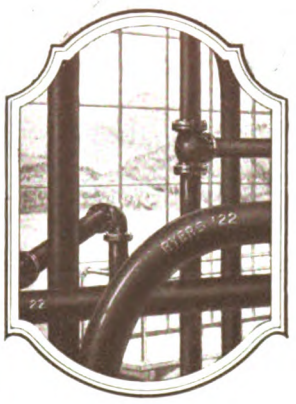
BYERS PIPE

GENUINE WROUGHT IRON



Giant Mikado type locomotive, showing 15 different exterior applications of pipe—all Byers.

Railroad Men know Pipe



They know pipe because they work with it, install it, and observe its behavior under the most trying conditions of service. Their very lives depend on the efficient operation of brakes supplied with air through pipes leading to every car composing the train.

The motive power itself is dependent on a multitude of pipes, the failure of any one of which may spell danger, delay and confusion.

In the railroad station as well as on trains, water, light and heat are furnished the travelers through pipes. Pipe is a most important element in signal systems.

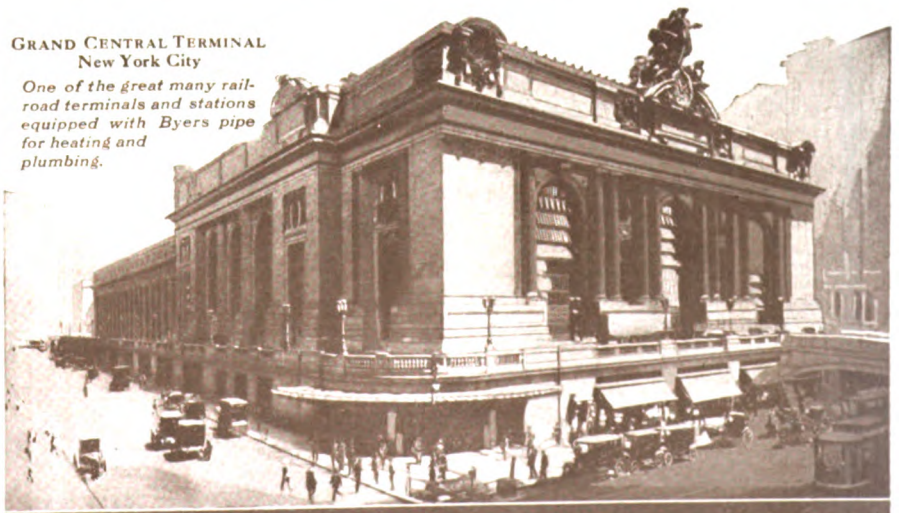
Many of America's leading railroads, after experimenting for many years with cheaper pipe, have come back to the use of the old-fashioned genuine wrought iron pipe for most of these important uses. This is entirely in accordance with the best railroad practice which specifies genuine wrought iron for a variety of services requiring high resistance to vibration and to corrosive attack. They know of no safer and better material than Byers to use wherever pipe is required.

Byers Bulletin No. 26-A "What is Wrought Iron?" is of interest to every railroad man, home builder, architect, engineer and plumbing contractor. Sent free on request.

A. M. BYERS COMPANY, PITTSBURGH, PA.

Established 1864

New York Philadelphia Boston Chicago Cleveland Houston



GRAND CENTRAL TERMINAL
New York City

One of the great many railroad terminals and stations equipped with Byers pipe for heating and plumbing.

Look for the Name and Year rolled in every length

Digitized by Google

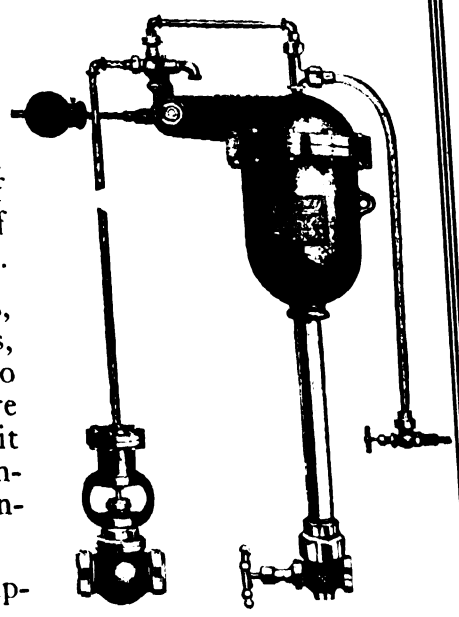
Save Fuel and Make the Boilers Safe

Install a Vigilant Feed Water Regulator

and keep the water-level within one-fourth inch of center-gauge regardless of the load or method of firing.

The Vigilant has no floats, no complex system of levers, toggles and small valves, no concealed parts or obscure steam passages. Nor does it depend upon the uncertainty of expansion and contraction. FREE TRIAL.

Write for free descriptive circular.



The Chaplin-Fulton Mfg. Co.

28-36 Penn Ave. **Pittsburgh, Pa.**

Also Manufacturers of the Fulton Pump Governor, Tank Governor, Reducing Value and Other Steam Specialties

edge of First Aid. It means service "outside of the line of duty." It means that telephone employees, wherever they may be, are to be prepared to relieve suffering, perhaps to save lives through special preparation to meet emergencies. In this connection the Vail medal records again afford convincing proof of the value of First Aid training. Two out of the three silver medals and eight out of the twelve bronze medals awarded for services involving a knowledge of First Aid methods were won by rendering treatment, not to fellow telephone employees, but to absolute strangers.

It is a far cry from a flag-draped hall filled with frantic rooters cheering their First Aid teams to such a scene, for instance, as that which was presented at the time of the Wall Street explosion. But it is a noteworthy fact that just such a knowledge of First Aid methods as results from these contests enabled an employee of the New York Telephone Company, on that never-to-be forgotten September day two years ago, to save the lives of two of the victims by applying tourniquets to their wounds. It is a far cry from the scene at Pittsburgh on April 26th to hundreds of other scenes occurring throughout the Bell System almost daily, when emergencies of greater or less seriousness arise and call for all that the telephone employee has of reserve, of resourcefulness and of knowledge as to the action which that emergency requires.

A far cry? Not so far a cry, after all. Between the sporting spirit of the First Aid contest and the serious business of saving lives there is not so great a difference, when one gets down to essentials. For behind the one is an instinct and behind the other is another instinct, and the two are just about the most deeply rooted of all the instincts which stir the human heart.

Both instincts are God-given, both are attributes of humanity itself. One is the instinct to excel—to do some one thing a bit better than one's fellow can do it. The other is the instinct, in times of suffering, of trouble, or of distress, to reach out the hand of common humanity and aid one's brother man.

Just Suppose--

You had coming to you every month

A big bunch of Pictured Progress

Such as you see in this copy of

Industry Illustrated

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name.....

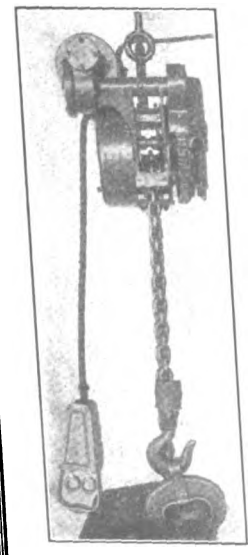
Mailing Address.....

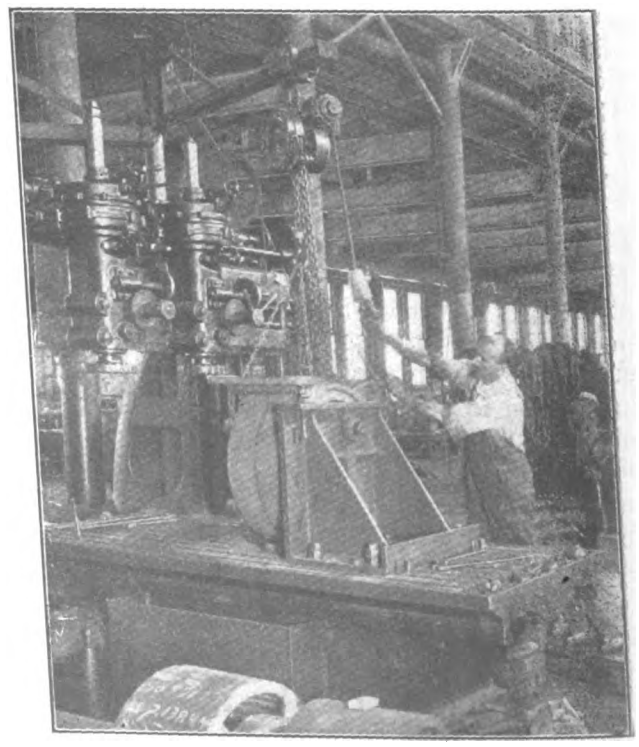
Company..... Position.....
(Important confidential information—for our own records only)

ANNUAL SUBSCRIPTION $1

In Canada, $1.25;
Foreign, $1.50

11-22





This new device, the Motorbloc, has been developed to serve the operations lying between the well-defined field of the standard hand chain hoist and that of the travelling electric hoist, with the substantial overhead and electrical installation which its heavy duty requires. The Motorbloc is a rugged, and readily portable Hoist, which can be installed without engineering preliminaries in any location where electric current is available.

Digitized by Google

The Overhead Trolley in Lumber Production

(*Continued from Page 25*)

operator's cab. The electric grapple is much quicker in action than the hand operated type.

The operation of a typical monorail system briefly described is as follows: Assume that lumber is to be carried from the dry sorting chains to the planing mill. The lumber from the sorting chain is piled into units directly under the monorail track in the sorting shed. When a unit is completed, the hoist comes along, stops over the bin from which the unit is to be moved, lowers the grapple hooks and picks up the unit. As soon as the grapple has cleared the bin the package is swung around until its length parallels the monorail track. The hoist then proceeds to the planing mill where the lumber is deposited upon the live rolls by the release of the grapple hooks. The operator sits in the hoist cage and regulates the hoisting, lowering and traveling motions by means of the controllers. A helper is sometimes used to expedite the engaging of units and looking after the bolsters where the grapple is hand-operated; but this is seldom necessary. No helper is needed when the grapple is motor-operated.

The most economical size of units is a subject of controversy among mill engineers. It might seem on first thought that the larger the unit, the more economical it would be. This is not true; for the real large unit requires a disproportionately large investment in track, supporting structure and even in the carrier itself. Furthermore, the real large unit is unstable and does not adhere together well when stacked, which is a decided disadvantage. Generally speaking the sizes which have been found most practical for the monorail are the 3 and 5-ton sizes.

Users of the monorail system claim that it has many advantages over other systems now in use. Among the principal advantages claimed are the following:

1. Handling costs are greatly reduced. Figures compiled by the Lumber Trade Journal in 1922 indicate that two men piling uniform lengths of lumber can stack approximately 25,000 board feet of lumber per day at an average cost of $0.26 per thousand feet. This figure includes only wages and not supervision or overhead of any kind. In a mill where the lumber is handled three times, then the total piling and unpiling cost alone is $0.78 for each 1,000 board feet of output. The bare operating cost of transporting lumber with the various types of ground carriers such as horses and dollys, trucks, trams, etc., including maintenance is not less than $0.50 per thousand board feet and is usually higher. The total average cost then of handling 1,000 board feet of lumber in a mill where hand stacking



A new "Y and E" desk at a surprisingly low price

THIS is the desk that organizes your day's work.

Everything is at your finger-tips. Center drawer holds pins, clips, pens, pencils, note-books, check-book, ruler, etc.

Other drawers may be used either for storage or as vertical files as in the illustration.

Standard "Y and E" filing supplies permit interior to be arranged to suit your special needs.
Features you will like about this desk are:

1. Box drawers cannot fall out even when open full length.
2. Inter-changeable drawer partitions permit arrangement for vertical filing of all standard size index cards and correspondence folders.
3. Standard "Y and E" quality. The same materials and the same fine workmanship used on the famous "Y and E" Efficiency desk.
4. Purchaser is entitled to a free survey of his desk requirements by a "Y and E" expert.
5. The price is so reasonable that you need no longer deny yourself a desk of this efficient type.

See this desk at the nearest "Y and E" branch store or mail us the coupon for a descriptive circular, color plates and prices.

"Y and E" REG. U.S. PAT. OFF.

YAWMAN AND ERBE MFG. CO.

Filing System Service, Equipment and Supplies

1143 St. Paul Street *ROCHESTER, N. Y.*

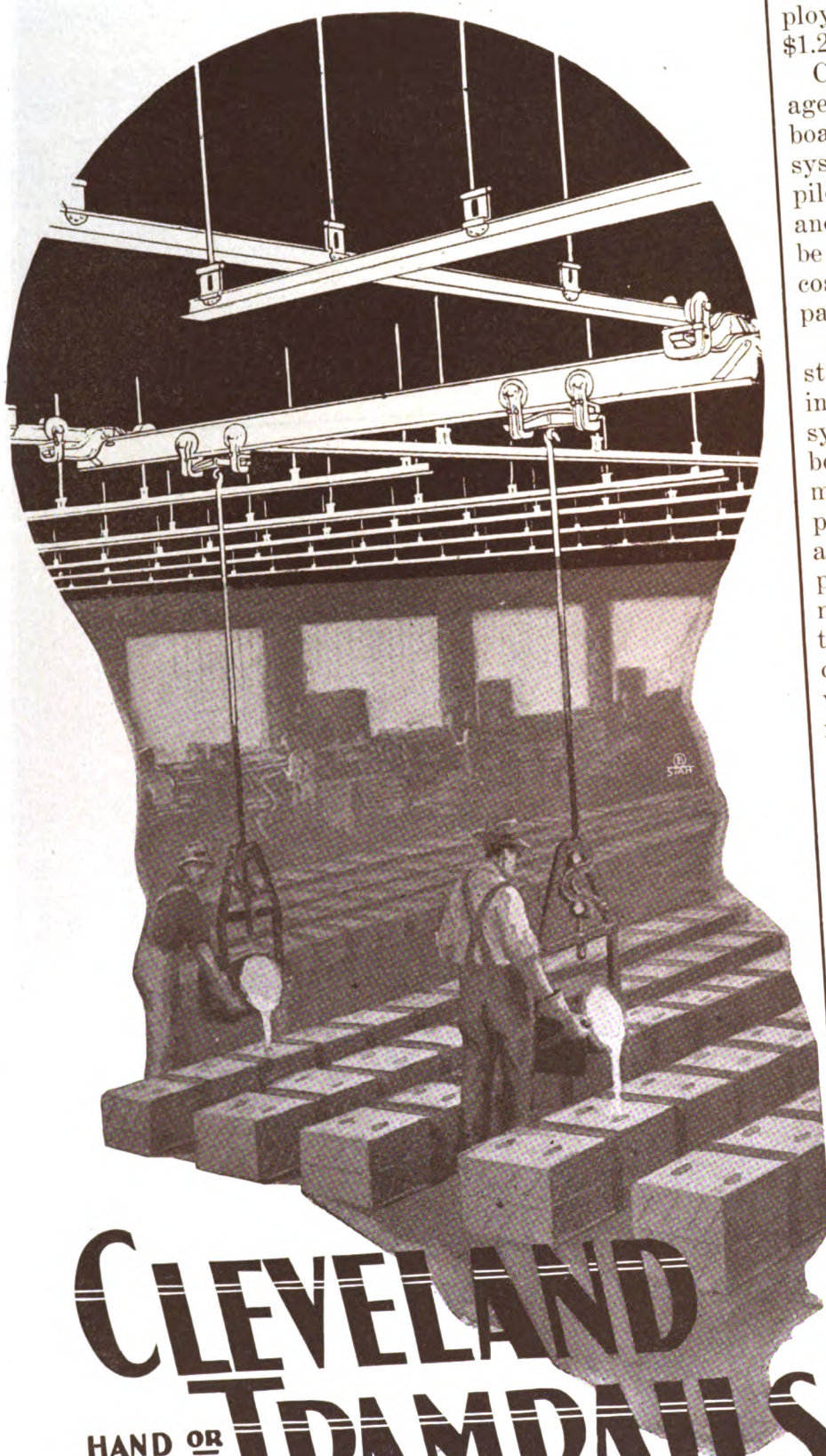
Yawman & Erbe Mfg. Co.
Rochester, N. Y.

Please mail me descriptive circular, color plates and prices on your new "Y and E" Desk.

Name_____

Address_____

Digitized by Google



CLEVELAND
HAND OR ELECTRIC TRAMRAILS

Use the Ceiling---

it too should be a profit earner.
Cleveland Tramrails will enable you to do your trucking on the ceiling—to save floor space—to eliminate expensive manual labor —and to speed up hoisting and conveying of materials.
It's a profit earner wherever used.

Send for our catalog.

Cleveland Electric Tramrail Division
of
The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

SALES OFFICES
50 Church St. New York City — *149 E. Larned St. Detroit, Mich.* — *Farmers Bank Bldg. Pittsburgh, Pa.*
1418 First National Bank Bldg., Chicago, Ill.

and ground conveyors are employed is $0.78 plus $0.50 or $1.28 per thousand board feet.

Compare this with the average cost of $0.13 per 1,000 board feet with the monorail system, which is a figure compiled in 1922 from 12 Southern and Western mills, and it may be seen that monorail handling costs are negligible when compared to hand costs.

It is not difficult to understand where these large savings come in with the monorail system. Most of the hand labor is eliminated. Furthermore the carriers use electric power which is usually generated from waste wood, so that power costs are practically nothing. Furthermore, when the mill is shut down, the power costs are eliminated entirely, which is not the case when animal transportation is used.

2. Handling is greatly expedited because of the rapid hoisting and traveling speeds. On account of these high speeds carload shipments can be quickly made up, quicker service can be rendered to customers and demurrage charges are reduced.

3. Another of the chief reasons for the economy of this system is the elimination of piling and unpiling each time the lumber is handled. The lumber remins as a unit, thereby dispensing with piece by piece handling which is both slow and costly.

4. Greatly decreased maintenance costs result from handling lumber by the monorail system. Horses, mules, tramways, tractors, trucks, buggies, etc., are dispensed with and consequently many plank alleys with their heavy maintenance expenses are eliminated. There is no danger of lumber being broken or damaged by dragging as is the case when it is transported close to the ground and the life of the planking in planing mill, on loading platforms and docks is greatly increased.

5. Where the monorail system is employed, the "A" frames can be roofed over at slight additional expense. The lumber for air seasoning stored beneath this shed dries more rapidly than it does when in the open and furthermore a better grade of lumber results. The more rapid drying of the lumber insures a quicker turnover of stock and consequently greater profits.

6. Because of the ease with which units may be shifted around it is always easy to get at the lumber at the bottom of of the pile, where it is usually the dryest. Shipping the dryest lumber means reduced freight charges and gaining the customer's good will, since it obviates the necessity of piling the lumber in his yard for further drying.

7. Since lumber can be quickly stacked to great heights with the monorail system, there is better economy of ground space than there is with other systems. This is a factor of great importance where land is valuable or where not much space is available. Lumber units can be stored with great regularity under monorail tracks thus adding greatly to the neat appearance of the yard.

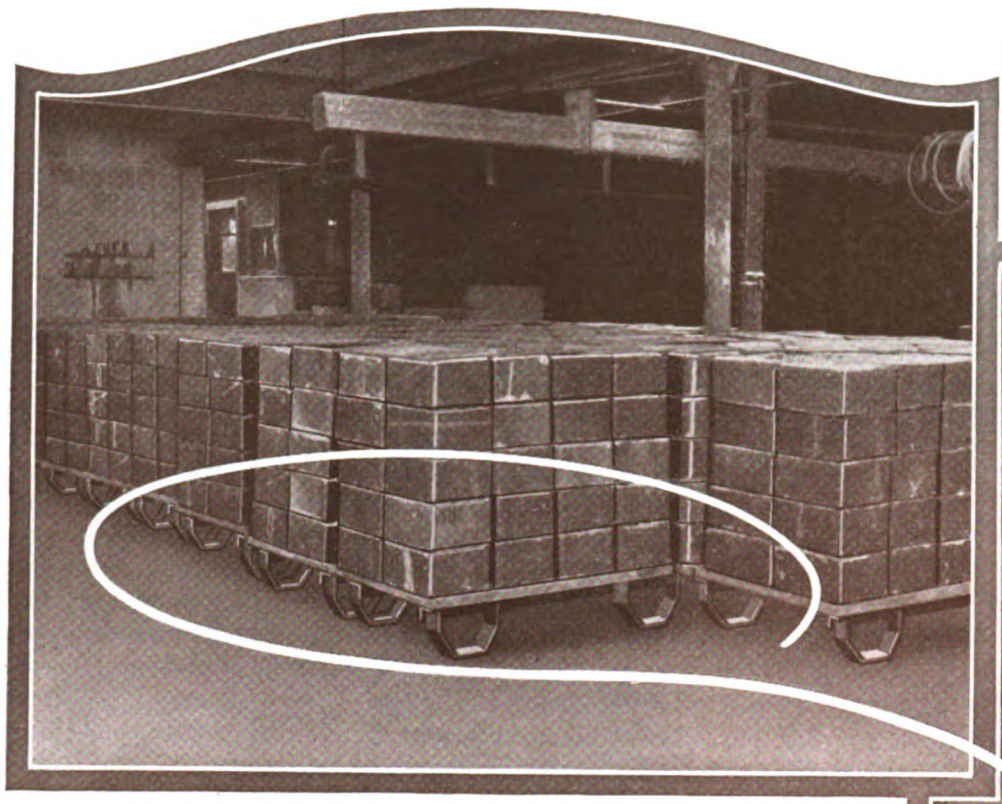
8. Due to the speed with which the monorail system handles units, a more effective arrangement of sorting chain and planing mill is possible. That is, instead of one long chain, the sorter may consist of a number of parallel chains, all in the same shed. Monorail tracks run on both sides of each chain, and these tracks are all connected by switches, so that one hoist can carry away the product from all of the chains. Of course, where the output is very great, two or more hoists may be used. This arrangement is very effective, saving much ground space. There is an additional saving, in time, due to the fact that no time is lost waiting for buggies to be returned and rustled about to their proper positions.

9. There is less fire hazard with the monorail system than with any other. In the event of fire in any portion of the mill, lumber piled in units can be quickly moved to a place of safety.

Many of the larger mills in the United States have come to use the Monorail System extensively for the handling of the product. It is not only the large mills that are using this system, for there are some with as small a daily capacity as 50,000 board feet that are making economical use of the Monorail System. One of the large

(*Continued on Page 70*)

Digitized by Google





It Pays—
A Few Inches Raise

These few inches often mean the difference between savings and waste.

Goods and materials placed, piled, or stacked on the floor must be loaded and unloaded by hand every time they're moved. This is waste—in time, labor, equipment, money.

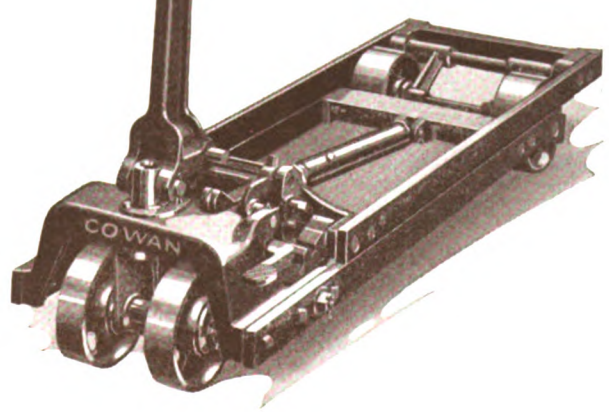
The "few inches raise" will convert this waste into many dollars of savings—cut down payroll expense, speed the movement of goods and materials, and economize in equipment and equipment maintenance.

Cowan Skids provide the "raise." Just as easy to use skids as it is to use the floor. Then one man and a Cowan Hand Lift Truck can pick up, move, and deposit loads weighing even thousands of pounds. No repeated hand loading and unloading, stacking, and restacking. No extensive equipment of platform or other similar trucks. Simple, inexpensive Cowan Skids and a few Cowan Hand Lift Trucks comprise the equipment that is eliminating the wastefulness of rehandling for thousands of concerns throughout the country.

No matter whether your problem is one of moving goods and materials from one manufacturing process to another, from department to department, from building to building, or is one of storage—whether you handle castings, lumber, boxes, bales, or what not—we have a message of enonomy for you that is worth while and convincing. A Cowan representative will gladly present it to you or we shall be pleased to send you bulletins and other information by mail.

One man with a single downward stroke of the Cowan Truck handle picks up skid and load.

Pressure on foot pedal lowers skid and load to floor, quickly and gently.



COWAN TRUCK COMPANY, 6 WATER ST., HOLYOKE, MASS.
N. Y. Office: Grand Central Palace. Offices in Principal Cities
Largest Manufacturers of Complete Hand and Electric Industrial Truck Systems

2060-N

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

Digitized by Google

MATERIAL



ELECTRIC TRACTORS

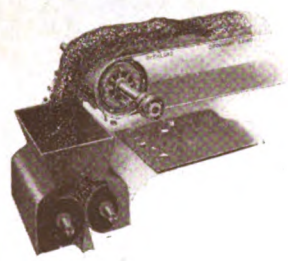
Transport Tons

where hand trucks move pounds. They reduce expense in all your departments.

Request Catalog 1208.

The Elwell-Parker Electric Company

Cleveland, Ohio



"High Duty" Magnetic Pulleys

For removing iron and steel from conveyed materials. Will positively protect your crusher, grinder or pulverizer against injury from "tramp iron."

Magnetic Mfg. Co.

267-275 23rd Ave, Milwaukee, Wis.

POWELL Pressed Steel Platforms



WHEREVER hand or electric lift trucks are used, POWELL Platforms have been the choice of executives who have compared their great strength, longer life and ease of handling. Cold pressed from a *single piece of steel.* Made in all sizes. Write for descriptive literature. Moderate prices.

The POWELL PRESSED STEEL CO.

HUBBARD, OHIO

SUBURB OF YOUNGSTOWN

NORTHWEST CRAWLER—

Cranes—with clamshell bucket or grappling hooks.

Draglines—for drainage jobs, excavating, grading.

Shovels—with only one motor—gas or electric.

A complete line proved in service. Patented crawler base provides

Unequalled Nobility

NORTHWEST ENGINEERING CO.

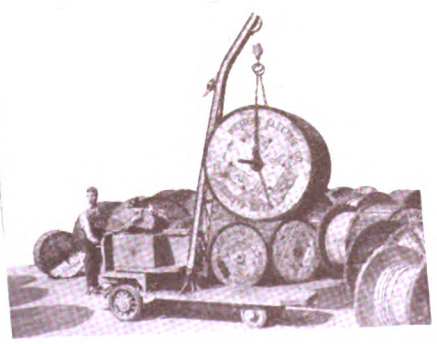
Works: Green Bay, Wis.

General Sales Office:

28 E. Jackson, Blvd., Chicago.



The Northwest Crane, shown below, cuts handling costs in a thousand and one operations. Write—



Easiest Way to Handle 3,000 Pound Pieces

is on Electric Industrial Trucks equipped with REVOLVING CRANES.

Bulletin 51 tells how.

The Elwell-Parker Electric Company

Cleveland, Ohio

HANDLING

(Continued from Page 68)

operators in the United States which has extensively adopted the Monorail System is the Pacific Lumber Co., at Scotia, Calif. This mill operates 28 hoists in all and has about 28,000 feet of Monorail track reaching every part of the yard.

Mr. G. M. Leaver of this Company estimates that each of these 3-ton hoists is equal to at least 4 or 5 single horse outfits with their drivers so that the pay roll savings are considerable. Taking into consideration the rapid depreciation of plank alleys which must be furnished when horse-drawn dolleys are used, Mr. Leaver believes that there is positively no comparison between the monorail and the ground system.

Another large mill that has adopted the monorail system for handling their entire product is the W. R. Pickering Lumber Co. at Haslam, Texas. This mill has an output of about 200,000 feet of lumber per day, the entire cut being kiln dried.

The accompanying sketch shows the arrangement of this mill. The flow of lumber is as follows:

Lumber upon leaving the saw passes to the green sorter, next to the saw mill. Here it is graded and piled on kiln cars, located on tracks served by an electric transfer car. The loaded kiln cars are carried on the transfer car and are run off on any of the parallel tracks leading to the twelve dry kilns.

After the kiln-dried lumber has cooled in the cooling shed, the kiln cars are carried upon a second transfer car which carries the lumber to the dry sorting shed, where it is regraded and piled into units on both sides of the sorting chain. One hundred units are piled on each side of the sorter.

A monorail track runs above the center of each row of units. The units are picked up by the monorail and are carried either directly to the planing mill or to the rough dry storage shed. Two 5-ton hoists are used to carry 200,000 feet of lumber per day from the sorting shed to the dry shed and about 10,000 feet daily directly from sorter to the planing mill. These hoists are also used to return the empty kiln trucks and sticks from sorter to stackers.

The rough dry lumber shed consists of a building 126 feet wide by 600 feet long with six monorail tracks passing through its entire length, so that there is ample storage space for Units under the tracks. The tracks are all connected at both ends of the shed by means of switches so that the hoists can very quickly pass onto any track. For this reason it is possible to bring lumber in at one end with one hoist and remove lumber stored under the same track by another hoist from the opposite end of the shed without confusion or interference.

A third 5-ton hoist carries dressed lumber from the planing mill either to the dressed lumber shed or to the shipping platform which runs alongside the dressed lumber shed.

This handling system at the Pickering mill, consisting in all of about 9,000 feet of track, with the three hoists and two transfer cars, has proved very flexible and economical.

The system at the Pickering mill has been in use since 1913 and has been eminently successful. Cost figures obtained in 1922 show that the handling costs per thousand board feet vary between $0.06 and $0.12 and average about $0.10 per thousand over a period of time.

The Pickering interests are now building a new mill at Standard City, Calif. This new mill will also use the monorail system for carrying its entire output. The initial layout calls for three hoists of 5 tons capacity and about 8,100 feet of special track.

The St. Paul and Tacoma Lumber Co. furnishes an interesting example of a mill which has adopted the monorail as a solution for their handling problems although not originally laid out for this system.

Due to the growth in this Company's business it became necessary for them to increase the capacity of their largest mill (Mill B) from 125,000 to 275,000 board feet daily. With his increase of capacity, means had to be found for increasing the capacity of the green sorting chain without extending the building. In order to avoid the congestion which would attend the attempt to carry of

Digitized by Google

such a large output by means of ground carriers, the sorting chain was built in three parallel rows, all in the same shed. Five parallel spur beams run between and outside of these sorters, these five spurs being connected by means of switches to a common spur beam. One hoist is able to take care of the output of all of these chains, the unit being picked up by the hoist and carried to the common track where it is lowered upon a tram car which runs to the kilns, drying yards or shipping dock. In order to speed up the handling, this hoist is provided with a two-motor-operated grapple, one motor being used for grappling, the other for turning the lumber unit.

A second hoist is used to convey lumber from the dry sorting chain to the planing mill. The green sorting chain of their new mill (Mill C) is also served by a third monorail hoist.

Over-head traveling lumber cranes are similar in design to the cranes widely used in steel mills, foundries, etc., being provided with three motors for the cranes proper, one for hoisting, a second for the bridge and a third for trolley travel. These motors are controlled by the operator from his cab, which is attached at a fixed point on the bridge or to the trolley itself. The lumber cradle is similar to that used on the monorail hoist, being suspended at four points from the double-drum trolley.

The lumber crane has practically all of the advantages ascribed to the monorail hoist, but in addition has quick and positive motion in three directions instead of two. This permits utilization of every square foot of area between the crane runway rails. Lumber may be stored to great heights under this crane, thus permitting a very large storage capacity.

The Weyerhaeuser Timber Company have made extensive use of Lumber Handling Cranes at their various mills. At Everett, Washington, they have a 10-ton box girder crane provided with an electrically operated grapple, which operates on a runway behind the planing mill. Lumber is brought in under the crane runway from three sources. First, on tram cars from the drying yard; second, on transfer cars from the dry kiln; third, directly from the green sorting chain on a transfer car. The lumber units which contain from 1,600 to 4,500 board feet are picked up by the crane and are carried and deposited upon live rolls behind the machines. When desirable, the units are piled three or four-high close to the rolls and are rehandled when needed. The average amount of lumber handled by this crane is about 400,000 board feet in 8 hours, but it has on many occasions handled more than 600,000 board feet of lumber in a single shift.

The Weyerhaeuser Timber Company use cranes not only at their mills but also at their warehouses. They have established a large warehouse system at Baltimore as an eastern distribution point for the product of their Pacific Coast mills. From 45,000,000 to 75,000,000 feet of lumber is carried in stock in the warehouses and adjacent yards.

Lumber from the ship is conveyed to a sorting shed by means of tram cars and live rolls. The sorted lumber is piled into units and taken by tram cars to one of the five lumber storage sheds through which Standard gauge railroad tracks run. Only one shed is charged at one time while the ship is unloading. Three of these sheds are served by 10-ton Pawling & Harnischfeger cranes of 72 ft. 6 in. span. The cranes are of the double-drum, 4-point suspension type with three motors on the cranes proper, and are provided with 2-motor electrically-operated grapples.

Generally speaking, the lumber industry, although perhaps the oldest industry, has been more backward in adopting modern handling methods than any other. This is not only to their own disadvantage, but it also constitutes a loss to the public and to future generations.

It is incumbent upon mill men to lower their handling costs so that they can log the lower grades of timber and market them at a profit.

MATERIAL



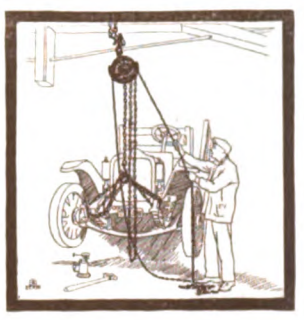
Chain Hoists FOR All Purposes

¼ to 30 Tons Capacity

Safe Dependable Economical

Our catalog will interest you

WRIGHT MANUFACTURING COMPANY
Lisbon, Ohio



EASTON CARS

EASTON CARS



COMPLETE INDUSTRIAL RAILWAY EQUIPMENT

2178-E
EASTON CAR AND CONSTRUCTION CO.
Main Office & Works: Easton, Pa. Branches in Principal Cities



COAL STRIKES

will not jeopardize your fuel supply if you are equipped with ROBINS CONVEYORS for storing coal.

Write for Bulletin No. 54 and learn how

ROBINS CONVEYING BELT COMPANY
New York Chicago Boston Pittsburgh



THROW AWAY YOUR WHEELBARROW and get a

BRADY
STEAM JET ASH CONVEYOR

Save hundreds of dollars. BRADY STEAM JET ASH CONVEYORS are saving money in hundreds of plants. Tell us your problem; send for our "Book of Facts."

We will show you just what we can save you.

THE JAMES A. BRADY FOUNDRY COMPANY
4510 Western Blvd. Chicago, Ill.

Also manufacturers and designers of Pneumatic Conveyors for handling granular and pulverized materials of all kinds.

Save Handling Expense!

Barrett Handling Equipment

BARRETT
LIFT-TRUCKS

Steeleg Lift Truck Platforms,
Portable Elevators, Portable Cranes,
Powerox Gas Tractor, Barrel Trucks.

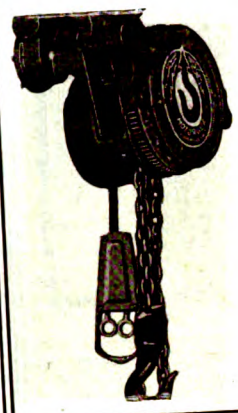
Write for full descriptive literature

Barrett-Cravens Company
1334W. Monroe St. Chicago, Ill

HANDLING

Digitized by Google

MATERIAL



MOTORBLOC

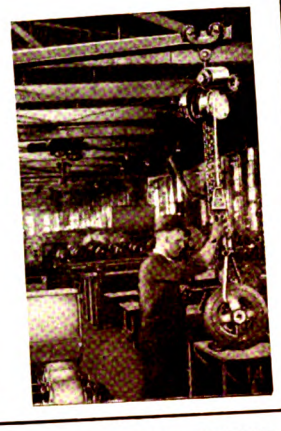
The Motor Driven Chain Hoist

The MOTORBLOC is hung up like any chain hoist. When connected to the nearest circuit, it is ready for work without any Engineering Preliminaries.

Light—Portable—Steel-Strong

"Hook Up, Plug In, Let's Go."

Write for full details



MOTORBLOC CORPORATION

Summerdale PHILADELPHIA

LEWIS-SHEPARD means LABOR SAVING

in Material Handling Equipment

Jacklift Elevating Trucks

The Master Stacker (or portable elevator)

Steel Leg and Wood Platforms for Lift Trucks

Self-loading Barrel and Case Truck

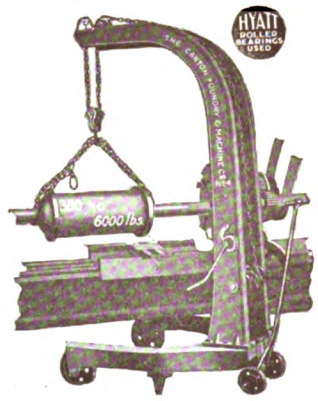
Our representatives are at your call and are prepared to render a real material handling service. Call on us.

LEWIS-SHEPARD COMPANY, 582 E. First St., Boston 27, Mass.

CANTON Portable Floor CRANE

Makes One Man's Time Worth Six

Truly "The Handiest Tool in the Shop." Goes where nothing else can reach. The CANTON will lower your lifting costs. *Send for catalog* F 15



CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
Permanent Exhibit Salesroom, Grand Central Palace, New York

Your advertisement should appear under this column.

See opposite page for rates and closing dates.

HANDLING

How Machinery Gets $15,000,000 a Year from Clam Shells

(*Continued from page 26*)

next week or two, they have developed sufficiently to shift for themselves, whereupon they detach themselves and drop to the bed of the river. If undisturbed there, they become full grown at the end of five years.

The trouble with this natural process of development is that the great majority of the tiny clams do not find fish to which they may attach themselves, and they die in their infancy. Experts of the Bureau of Fishery then conceived the idea of artificially infecting the fish with the parasites, and immediately the problem was solved. Under this artificial treatment a fish can carry a thousand or more embryo mussels in its gills, whereas under natural conditions it may become host to only a dozen or so.

The principal mussel yielding streams are found in the states of Minnesota, Wisconsin, Illinois, Missouri, Arkansas, Indiana, Ohio, Tennessee, Kentucky, and Alabama, the Mississippi river producing the largest number of shells. The mussel fishery is a permanent and important industry, and in scarcely any locality where a shell fishery was once established has it ever been entirely abandoned, although the intensity of the fishery in any locality may vary from year to year, as it is subject to a variety of influences, such as the demand for shells of certain qualities, the stages of the river, the condition of the local industry, and the degree of exhaustion of the material.

The method of mussel fishery most generally in use today is with the so-called bar and crowfoot hooks. The method is based on the characteristic habits of fresh-water mussels, which lie habitually half embedded in the bottom of a stream, with the hinder end of the shell directed against the current and slightly gaping. If a stick or hook be inserted into the opening of the shell, the mussel at once closes tightly and will hold for a long time, even while being dragged over the bottom and hauled up to the boat. Mussels are thus sometimes accidently taken on ordinary fishhooks, while pearl fishermen working in shallow water have long employed a sharpened stick that could be inserted into the opening of the individual mussel.

The more elaborate apparatus now used was first brought to the notice of the rivermen of the upper Mississippi in 1897, and its use soon spread throughout all of the commercial districts. The crowfoot apparatus consists essentially of a bar or rail to which many short lines, bearing four-pronged wire hooks, are arranged at intervals. By means of a towing line the bar is dragged above the bottom, while the hooks trail on the mussel bed in a direction parallel to the current. When a hook enters a shell opening, the mussel closes upon the hook, and in consequence is dragged from the bottom. When the bar is raised after a suitable time, numerous mussels may be hanging from the hooks. It is usual to equip barges with a number of these bars and their accompanying hooks, so that the bed of a stream may be dragged thoroughly. The most satisfactory boat has been found to be the ordinary john boat. Its length is from 14 to 20 feet, with a width at the center of from 3 to 5 feet, but it always has narrower ends, and is usually of light draft. For work on a much larger scale, heavy barges, approximately 10 by 40 feet, are used.

After the mussels are brought ashore the soft parts must be removed. Where pearling is the exclusive object, each mussel may be opened with a knife inserted between the valves of the shells, so as to sever the adductor muscles: the meat is then taken out and examined for pearls. Such a process, however, is entirely too slow and tedious for preparing shells for the market, and so the cooking out process is exclusively employed in the shell fishery. The mussels are cooked in a vat 5 feet long by 2 feet wide and from 12 to 18 inches deep. When the cooker is filled with mussels, a small amount of water is added, and

Digitized by Google

the whole is covered with burlap or gunny sacks. The fire is then started in the furnace and continued until steam is being given off in quantities sufficient to kill the mussels. This usually takes about a half hour.

After reaching the button factory the shells are first soaked in tanks or vats for a week or more. The soaking process is intended to soften the material, which would otherwise be too hard on the saws which are to cut them up, as well as so brittle as to chip and yield blanks with rough edges. The machine used in cutting is essentially a lathe fitted with a tubular saw of the necessary diameter to obtain the required size of button, and a wooden plug and a ratchet handle or lever for gradually forcing the rough shell against the rapidly rotating saw. The shell is held in position either by prongs or by the hand protected with a mitten. Successive blanks as they are cut are crowded through the tubular saw to fall into a receptacle below. The sizes of the buttons are determined by the inner diameter of the cutting end of the saw, and they range from about one-third of an inch to one inch in diameter. In novelty works buttons up to an inch and a half or larger are made.

Before going to the finishing machines the blanks are usually passed through four intermediate processes. First they are passed through a blank classifier, where, by falling between rollers they are separated into different lots according to thickness. Next they are placed in tumblers, consisting of heavy and slowly revolving barrels of iron or wood, in which they are churned with water and pumice stone to clean them and remove any possible rough edges. The blanks are then ready for the grinder, a machine fitted with an emery wheel which grinds away the horny backs and reduces the blanks to a uniform thickness. Finally the blanks are again soaked in water to be softened for the finishing machine. They are then ready for the essential processes of button making, which are accomplished by an automatic machine of comparatively recent invention and of very ingenious design.

The blanks are then fed by hand into depressions in the tops of vertical chucks, which are arranged in series constituting an endless chain. As the chucks in the endless chain pass around the circumference of the machine each blank is automatically operated upon by various tools, and each tool is automatically sharpened and prepared for the succeeding blank. The processes accomplished in the machine consist in rounding the edges and carving out the center in the desired pattern. After the first hole the drill rises, the button makes a turn through a fourth or half of one revolution (according to whether it is to be a four-hole or two-hole button), when the drill again descends to make a new hole. After the last hole is drilled the chuck opens automatically to release the button, which is sucked into a tube connected with the blower system to be dropped into a bucket through a counting tube.

From the cutting machine the buttons are taken to the churns, where they are tumbled, or churned, with water and pumice stone to clean them, take off the rough edges, and make them ready for receiving the final polish. The polishing is also a tumbling process, in which, however, sulphuric acid is used in conjunction with steam. After the buttons are dried in shakers with sawdust, they are placed with dry sawdust and washing powder in a combined tumbler and shaker. This process removes any trace of limy deposit and gives the final luster. Finally the buttons are conveyed in buckets or boxes to the sorting room where they are sorted according to qualities and grades and sewed to suitable cards for packing in boxes, ready to be sold.

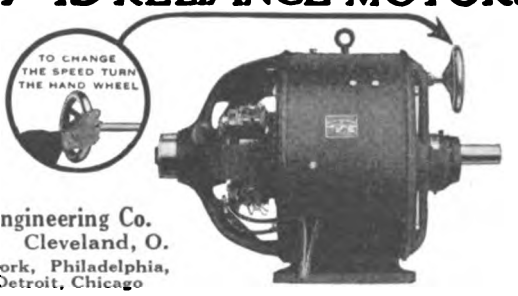
It would be difficult to find an industry offering greater contrasts in method—the slow, tedious and wasteful methods of gathering the mussels, in the first place, and then the highly mechanicalized processes of cutting, shaping, polishing and packing. There does not seem to be any way by which mussel-gathering could be modernized; this is a very primitive process.

POWER

THESE motors will provide your machines with operating speeds to suit all kinds of jobs. They run at any speed over ranges up to 1 to 10. There is no power lost as speed is varied.

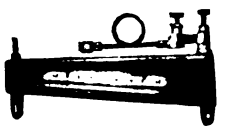
Get bulletin 1014 for details

Type A-S Adjustable Speed RELIANCE MOTORS

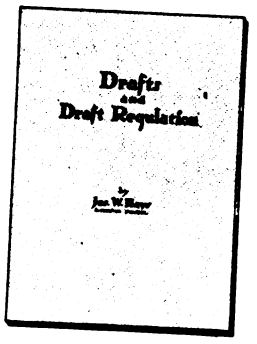


Reliance Electric & Engineering Co.
1045 Ivanhoe Road Cleveland, O.
Branches: Boston, New York, Philadelphia, Pittsburgh, Cincinnati, Detroit, Chicago

An Interesting Booklet for the Asking



The greatest cause of fuel waste is faulty draft regulation—too much excess air diluting the gases of combustion and cooling the heating surfaces. Mr. Hays' treatise on "Drafts and Draft Regulation" contains a fund of sound, practical information on this important subject.
It also describes and illustrates various types of Hays' Draft Gages, which rugged instruments are designed especially for use in the boiler room.



The Jos. W. Hays Corporation
Combustion Efficiency Appliances
Michigan City, Indiana

With the January issue the rate for space in this section will be $20.00 per advertisement. We are offering these until then at $18.00 per month.

This small announcement will absolutely pay you in big dividends and will secure from INDUSTRY ILLUSTRATED'S 20,000 executive readers an attention far out of proportion to its cost.

Copy for the December issue can be received up to November 14th.

SEND IT IN IMMEDIATELY

Advertising Department
INDUSTRY ILLUSTRATED
120 West 32nd Street
New York

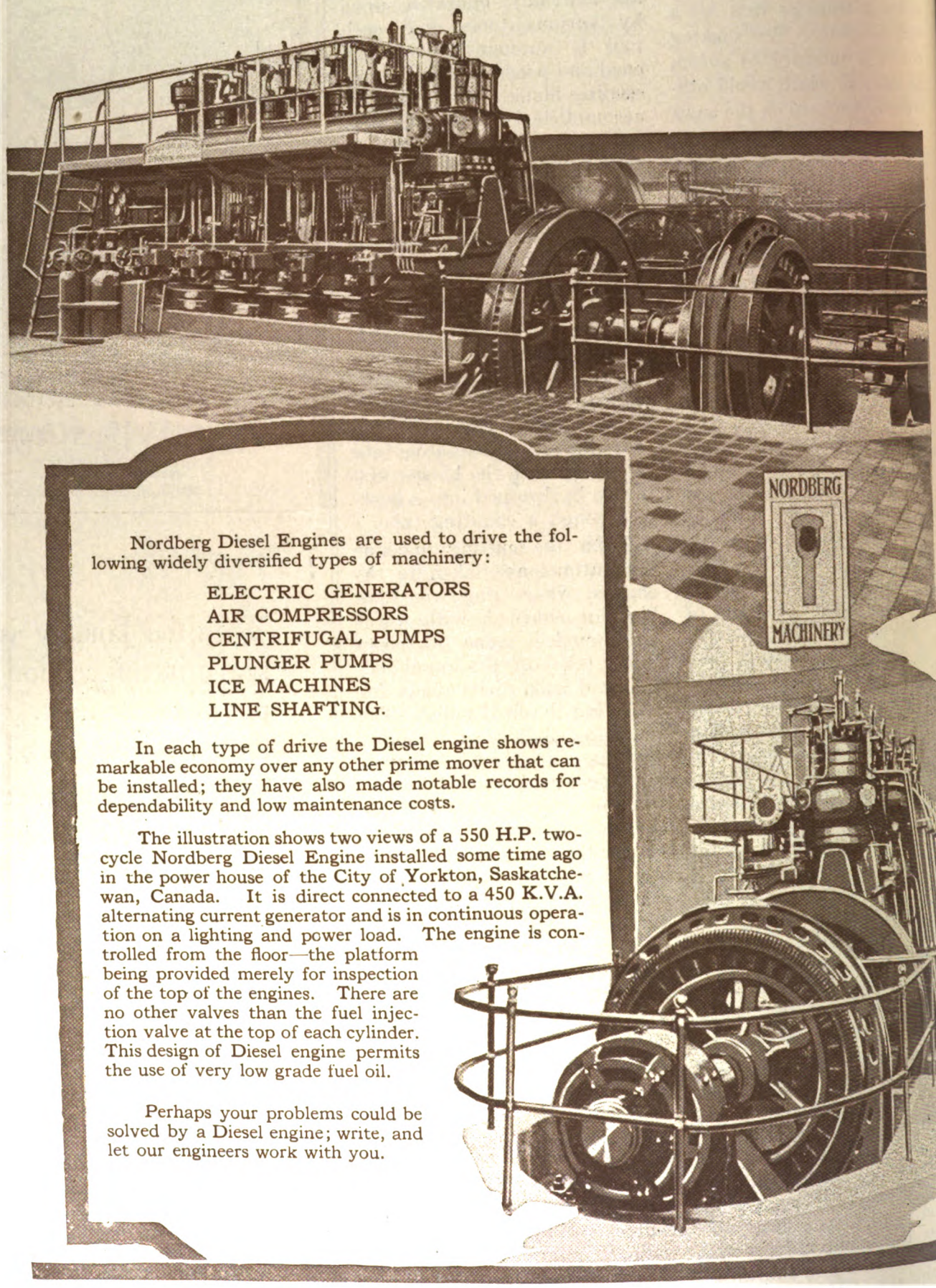
EQUIPMENT

Digitized by Google

NORDBERG CARELS DIESEL ENGINES

NORDBERG PRODUCTS

Diesel Engines,
Uniflow Poppet Valve Engines,
Corliss Engines,
Blowing Engines,
Air Compressors,
Gas Compressors,
Steam, Air and Electric Mine Hoists
Condensers,
Special Machinery.



Nordberg Diesel Engines are used to drive the following widely diversified types of machinery:

ELECTRIC GENERATORS
AIR COMPRESSORS
CENTRIFUGAL PUMPS
PLUNGER PUMPS
ICE MACHINES
LINE SHAFTING.

In each type of drive the Diesel engine shows remarkable economy over any other prime mover that can be installed; they have also made notable records for dependability and low maintenance costs.

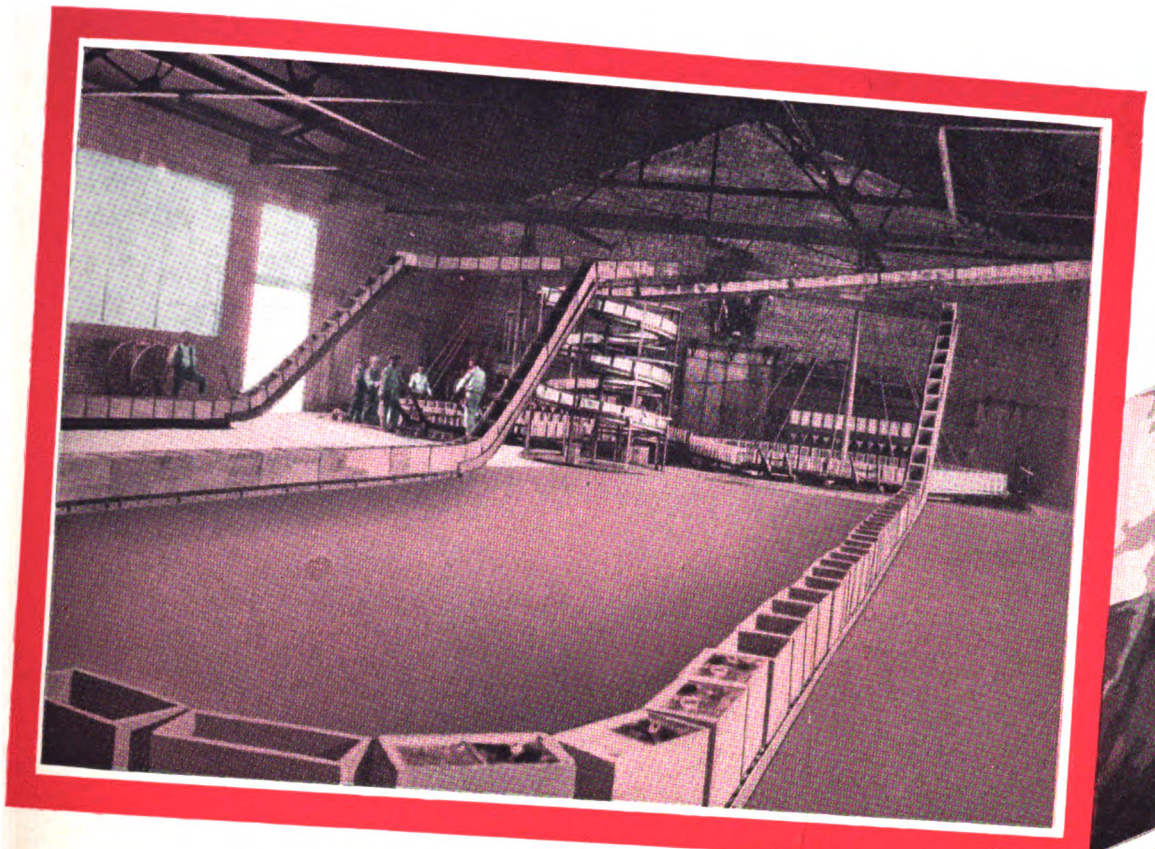
The illustration shows two views of a 550 H.P. two-cycle Nordberg Diesel Engine installed some time ago in the power house of the City of Yorkton, Saskatchewan, Canada. It is direct connected to a 450 K.V.A. alternating current generator and is in continuous operation on a lighting and power load. The engine is controlled from the floor—the platform being provided merely for inspection of the top of the engines. There are no other valves than the fuel injection valve at the top of each cylinder. This design of Diesel engine permits the use of very low grade fuel oil.

Perhaps your problems could be solved by a Diesel engine; write, and let our engineers work with you.

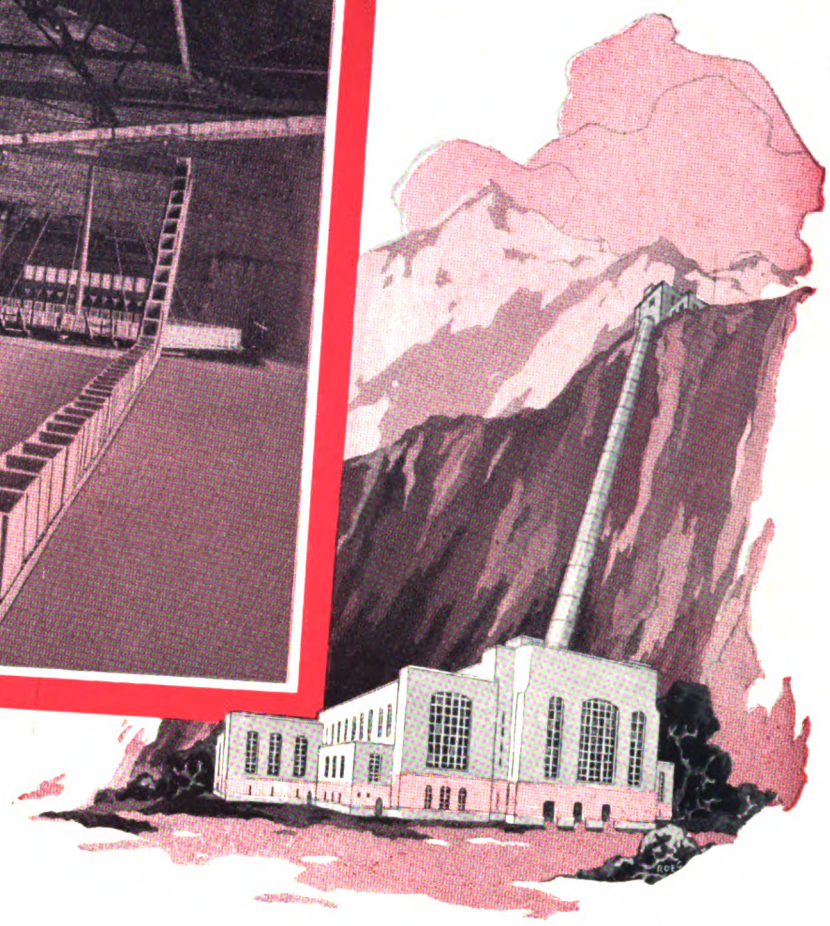
NORDBERG MANUFACTURING CO.

MILWAUKEE WISCONSIN

Digitized by Google



Lamson Conveyor bringing empty cans into filling room of Carson Petroleum Company



For SPEED use a fast thin stream

THERE'S many a river that does not turn a wheel. The water does not flow fast enough. But the pipe carries a narrow stream from the dam to the powerhouse with all the speed necessary to move the machinery.

Lamson Conveyors will carry the work through your plant in just such a fast thin stream. Materials will not pile up between machines, but will move at a uniformly rapid rate from process to process. Your output will increase. A mechanical conveying system eliminates the extra handling that slows up production and tires out workers.

Perhaps you need a conveying system to increase your output and speed up deliveries in your plant. Ask a Lamson representative to call on you. It is likely he can tell you in dollars and cents and days how you can save by installing a Lamson Conveying System.

THE LAMSON COMPANY
SYRACUSE, NEW YORK
Branches in Principal Cities

Lamson Conveying Systems

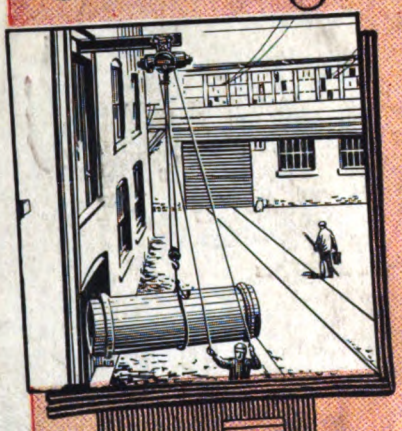
LAMSON SERVICE

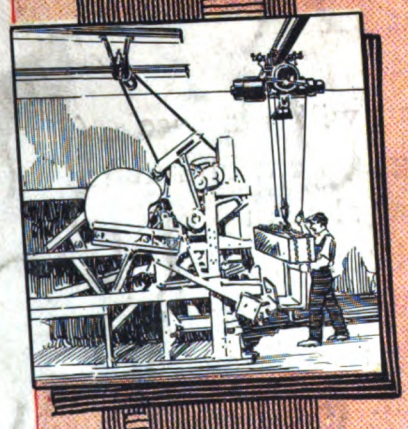
Digitized by Google

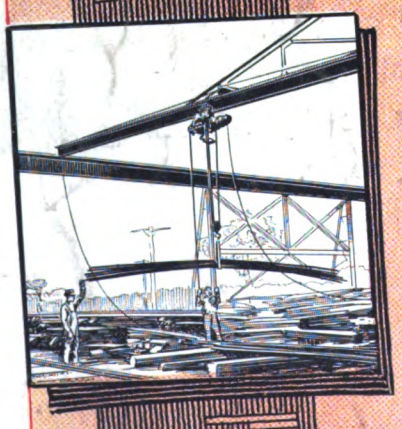
THE SHEPARD ELECTRIC LIFT ABOUT

A new and smaller Electric Hoist

Shortage of Unskilled Labor is Growing Acute -It's your problem







THERE is less unskilled labor available today than for years past and more work for it to do. Statistics show that for the past three years many more alien laborers have left this country than have entered. This fact coupled with restricted immigration are chief reasons for wage increases and the growing labor shortage in many industries in various parts of the country. *Labor costs are high and will continue to be so.* Machinery for replacing labor is the one remedy at your command.

This powerful little *LiftAbout* is the mechanical means for lifting and moving your loads. It will protect you from labor shortage, and save hundreds of dollars in high wages.

In numerous ways it is replacing from three to a dozen men—doing more work than men could do, and in much less time. We can cite case after case where a *LiftAbout* has paid for itself in a few months, often within a few weeks.

Standardized manufacture and quantity production make the *LiftAbout* low priced. It has same features that have made "Shepards" the most widely used electric hoists in America.

It can be used most everywhere, indoors or out. Quickly installed to run on overhead track, taking up no floor space.

Shown here are but few of the many applications. If your business calls for the lifting and moving of loads, investigate this "great economizer" TODAY.

We also build electric hoists and cranes in capacities to 30 tons.

SHEPARD ELECTRIC CRANE & HOIST COMPANY
420 Schuyler Ave., Montour Falls, N. Y.

Branches in Principal Cities — Member Electric Hoist Manufacturers' Association

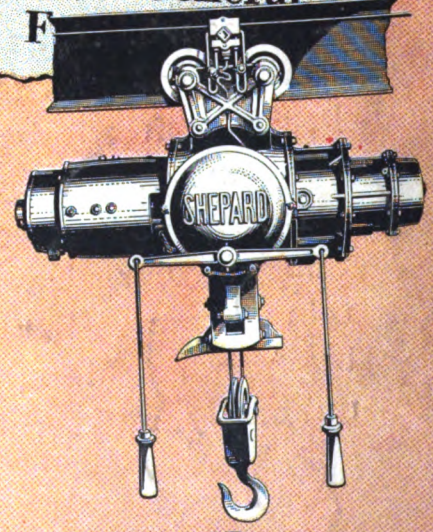
SHEPARD
ELECTRIC CRANES & HOISTS

NEW YORK TRIBUNE.

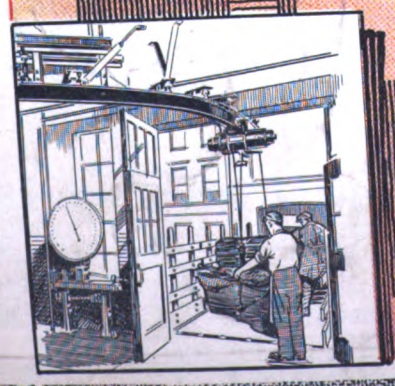
Plans to Cut Alien Influx To Minimum

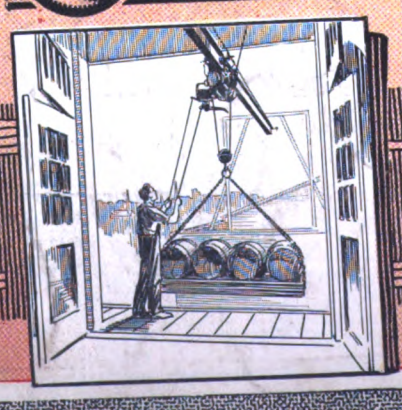
Chairman Johnson of Immigration Committee Suggests Half of One Per Cent as the Basis

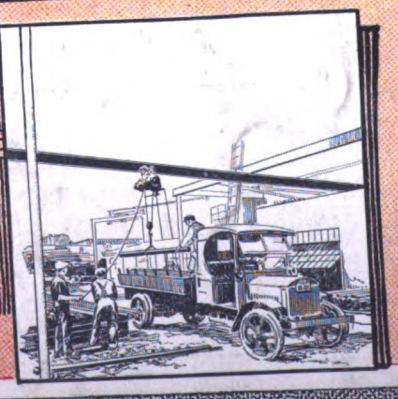
Demand General F



SEND FOR *this pamphlet which shows more applications, many in businesses paralleling yours.*









Digitized by Google

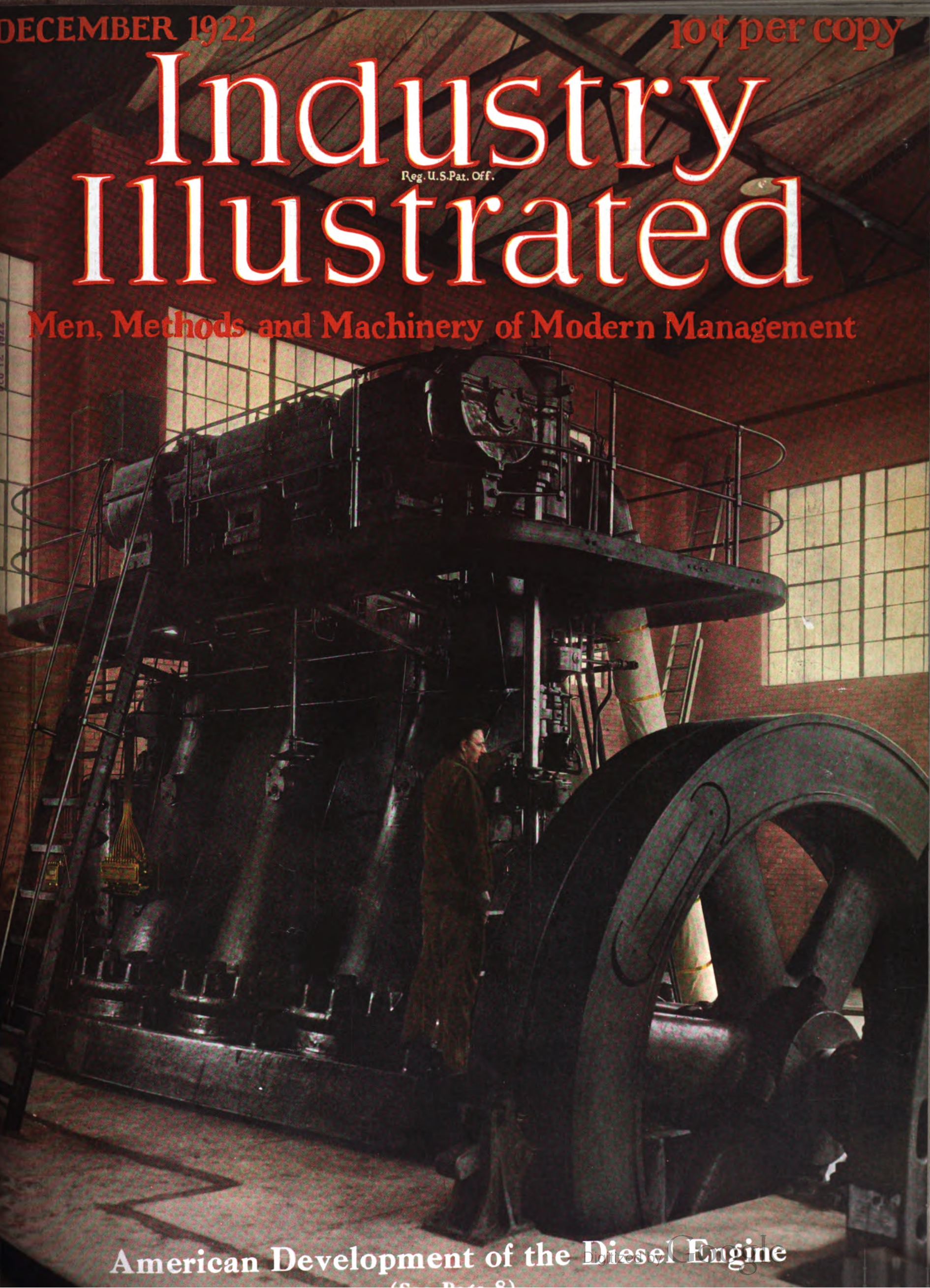
DECEMBER 1922

10¢ per copy

Industry Illustrated

Reg. U.S.Pat. Off.

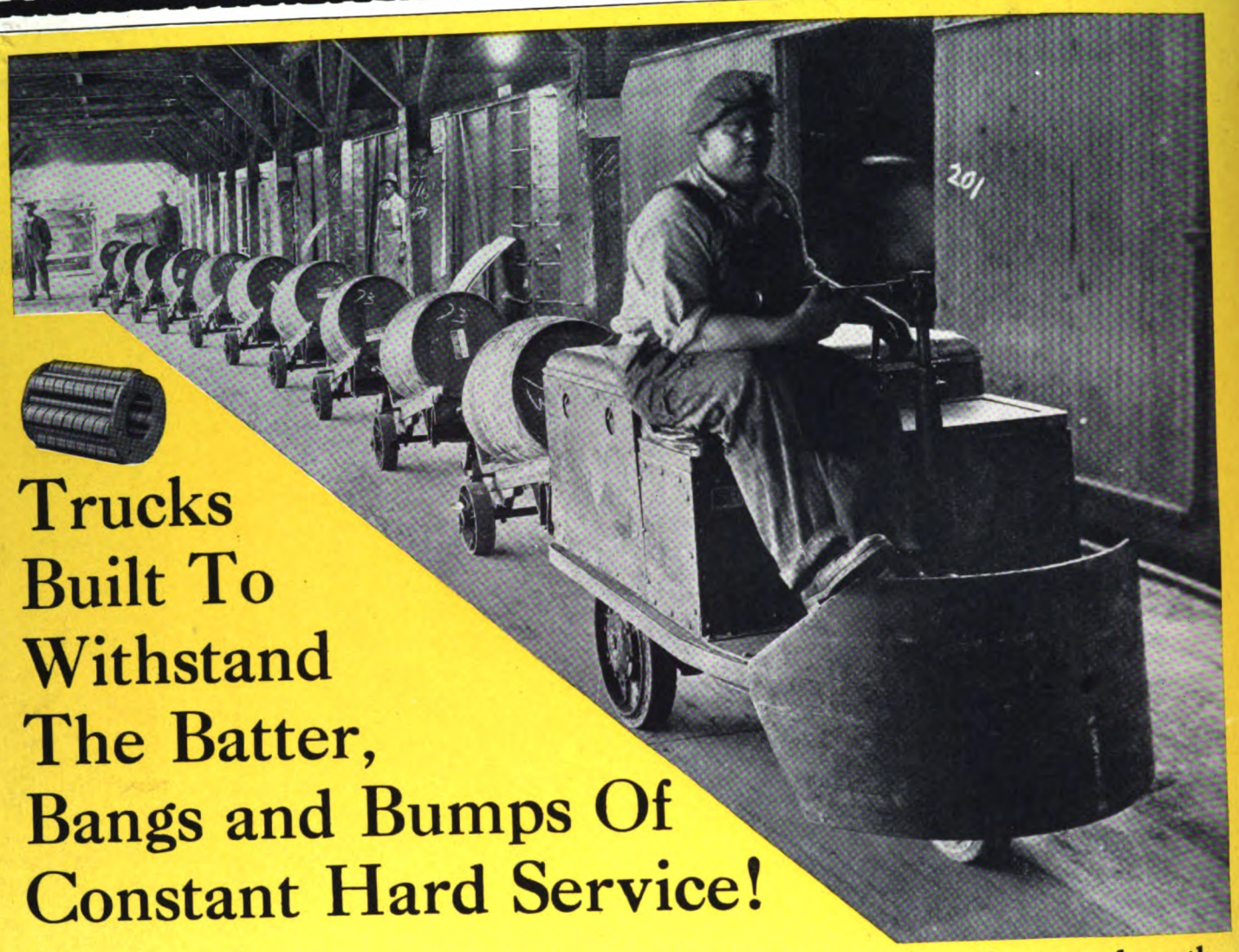
Men, Methods and Machinery of Modern Management



American Development of the Diesel Engine

Digitized by Google

(See Page 8)



Trucks Built To Withstand The Batter, Bangs and Bumps Of Constant Hard Service!

The ability to stand up under abuse, the stamina that is built into Hyatt roller bearings, makes them a logical part of every truck that has real loads to carry.

On such trucks as those shown in the photograph, plain bearings quickly wear, producing wobbly wheels and hard running, lubricant wasting trucks.

Trucks equipped with Hyatt bearings operate for years without the necessity of bearing adjustment or replacement because there is no appreciable wear of the sturdy steel rollers.

Sturdily built three-wheel trucks equipped with Hyatt roller bearings and manufactured by the Lansing Company, Lansing, Mich., in operation at the No. 3 Freight House of the New York, New Haven & Hartford Railroad, Providence, R. I.

These permanent rollers produce the easy rolling motion that enables one man to handle the heaviest loaded truck and enables tractors to pull twice as many trailers.

One greasing every three months is the only attention required by a Hyatt bearing truck.

If you have heavy loads to move economically, surely and quickly, it will pay you to put them on Hyatt bearing trucks. Specify that your new trucks be Hyatt equipped, and ask us about Hyatt bearing replacement wheels for your present trucks.

Hyatt Roller Bearing Co.
Motor Bearings Division, Detroit
Tractor Bearings Division, Chicago

USE HYATT BEARINGS ON YOUR LINE SHAFTS TOO
BULLETIN 127

Industrial Bearings Division
New York, N. Y.
Pacific Coast Division
San Francisco

Digitized by Google

INDUSTRY ILLUSTRATED

CONTENTS

December, 1922

Editorial—Multiplying Man Power Page 7

American Development of the Diesel Engine 8
By W. Thomson Lees—How Ignorance and Prejudice are being Compared by this Most Efficient Prime Mover.

Material Handling in the World's Most Modern Sugar Refinery 12
By Homer L. Rank.

Cutting All the Teeth of a Gear at Once 15

Graphics as a Production Stimulant 16
By John H. Van Deventer—How it is Applied to Westinghouse Automotive and Radio Equipment.

Getting Out from Behind the Horse 19
By Ernest H. Rowe—The Career of Ellwood Haynes.

Handling Coal and Ashes on the Pivoted Bucket Carrier 20
By C. H. Mc. L. Burns—Labor saving Device that improves Power Plant efficiency.

Five Essentials of a Suggestion System 22
By George W. Gray—How this Important Detail is handled in Large Manufacturing Plants.

Weighing "On the Move" 23
Time and Labor-Saving Device for Weighing Materials Without Stopping their Progress.

Getting Figures that Can Not Lie 24
By Ernest H. Rowe—The Evolution of the Adding Machine.

How Machinery Builds Roads 26
Improved Machinery Facilitates Rapid Construction.

For photographs in this issue not otherwise credited, we are indebted to The Link Belt Company and The Stevenson Gear Company.

Published Monthly at Cooperstown, N. Y., by
THE ENGINEERING MAGAZINE CO.,
Founded 1891 by
JOHN R. DUNLAP
Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — WALTER IVES, *Vice-President* — RUTLEDGE BERMINGHAM, *Vice-President*
JOHN R. DUNLAP, JR. *Secretary-Treasurer*

Vol. 3, No. 6. Subscription price $1.00 per year; single copies 10 cents. Copyright, 1922, by The Engineering Magazine Co., in both the United States and Great Britain. Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google

VITROLITE

MAKES THESE BETTER

Bath Room Fixtures

Barbers' Fixtures

Cabinets

Cash Register Shelves

Chairs and Stools

Counters

Dental Supplies

Display Fixtures

Hospital Furnishings

Ice Box Partitions and Facings

Lighting Fixtures

Partitions

Scale Platforms

Shelves

Soda Fountains

Surgical Supplies

Table Tops



Would It Add Sales to Your Product?

A STRIP of immaculate white Vitrolite—cleaner—more durable—naturally users prefer it to glass or marble in the products they buy. Here's a material that marks your product as better at first glance—its snowy whiteness stands out as a visible guaranty of cleanliness. And Vitrolite *is* sanitary—even the strongest acids can't stain it—nor dust and dirt cling to its smooth surface—an occasional rub with a damp cloth keeps it spotless.

Buyers appreciate its longer service, too—many times that of glass or marble. For Vitrolite's tensile strength—50% greater than that of marble—makes it proof against chipping and cracking where other materials would be a constant hazard. Wherever your product is judged by cleanliness, sanitation and durability—replace glass and marble with Vitrolite. It gives you all these sales advantages—plus a considerable reduction on manufacturing costs.

For many years Vitrolite has been the pioneer material for white restaurant table tops. Now it is ready to help increase sales for a thousand and one other products. If you make any of those in the adjoining list—or others where increased cleanliness and serviceability influence the buyer's preference—we want to give you the complete facts on Vitrolite. A letter brings the details—write it today.

THE VITROLITE COMPANY

Chamber of Commerce Bldg. **Chicago, Illinois**

VITROLITE



Digitized by Google

Can You Manage a Million Dollars?

"I can secure a million dollars ten times while I am finding a man with the capacity to administer a million dollars at work"

was a saying of the late James B. Dill, who organized the United States Steel Corporation.

But even a million dollars is not much in these days of enormous industrial undertakings. Do *you* feel that *you* are competent to administer a million dollars at work?

Big industrial organizations cannot afford to place the responsibilities of management into the hands of men who become wise only through disastrous personal experience. Industry *does* want men who have learned from the long experience of other men those things which are recognized as successful principle or practice.

What You Must Know

To be a successful industrial manager you must be fully informed concerning all factors which affect the control and operation of men, methods, material and equipment. If you know only those things which are associated with equipment or materials, then you certainly cannot act correctly and decisively concerning problems of men or methods. You have to use snap judgment—in other words you *guess*.

Industry does not want any more guesswork. The millions of dollars of waste which have been the yearly record of industry must be saved. And it can be saved only by intelligent, competent management.

You can participate in this management only if you have accumulated a knowledge of successful methods which have been worked out by many industrial executives and engineers, in many plants, and in all branches of manufacturing.

You cannot get this knowledge by personally visiting hundreds of plants and studying their methods. Even if that were possible you would be a very old man before you had completed your study.

How You Can Get It

You can, however, get the benefit of the wide experience of men who have spent their best years in the industrial field. You can learn those successful methods which they worked out after years of experiment and study. You can avoid all of the mistakes which they made. You can start with the sound principles and practices which they have spent years in perfecting.

More than one hundred men helped to prepare the Factory Management Course and Service, which the Industrial Extension Institute offers to you. Each one of these men is a specialist of national reputation in some phase of industrial management work.

These men have spent an average of twenty years each in industrial work.

You can get the benefit of their aggregate experience of approximately two thousand years in the industrial field by enrolling for the Factory Management Course and Service.

The Proof

The details of the Institute work are given in a booklet entitled "Thinking Beyond Your Job" which will be sent to you upon request.

That the Factory Management Course and Service is the only adequate means of getting the broad fundamental and practicable knowledge necessary for modern industrial management is indicated by the action on the part of the following well known organizations in having the training brought to their key men.—

Studebaker Corporation
International Motors Corporation
New Jersey Zinc Company
Robert Gair Company
American Cotton Oil Company
Atlantic Refining Company
Johns Manville Company
Worthington Pump & Machinery Corp.

Industrial Managers are Wanted
Can You Qualify?
If not—let us help you

MAIL THIS COUPON—*NOW!*

Industrial Extension Institute
Nine East 45th Street . New York City

Send me the details of your plan and your booklet "Thinking Beyond Your Job" without obligations.

Name .....
Firm .....
Address .....
City and State .....
Position .....

Ind. Illus., Dec., 1922

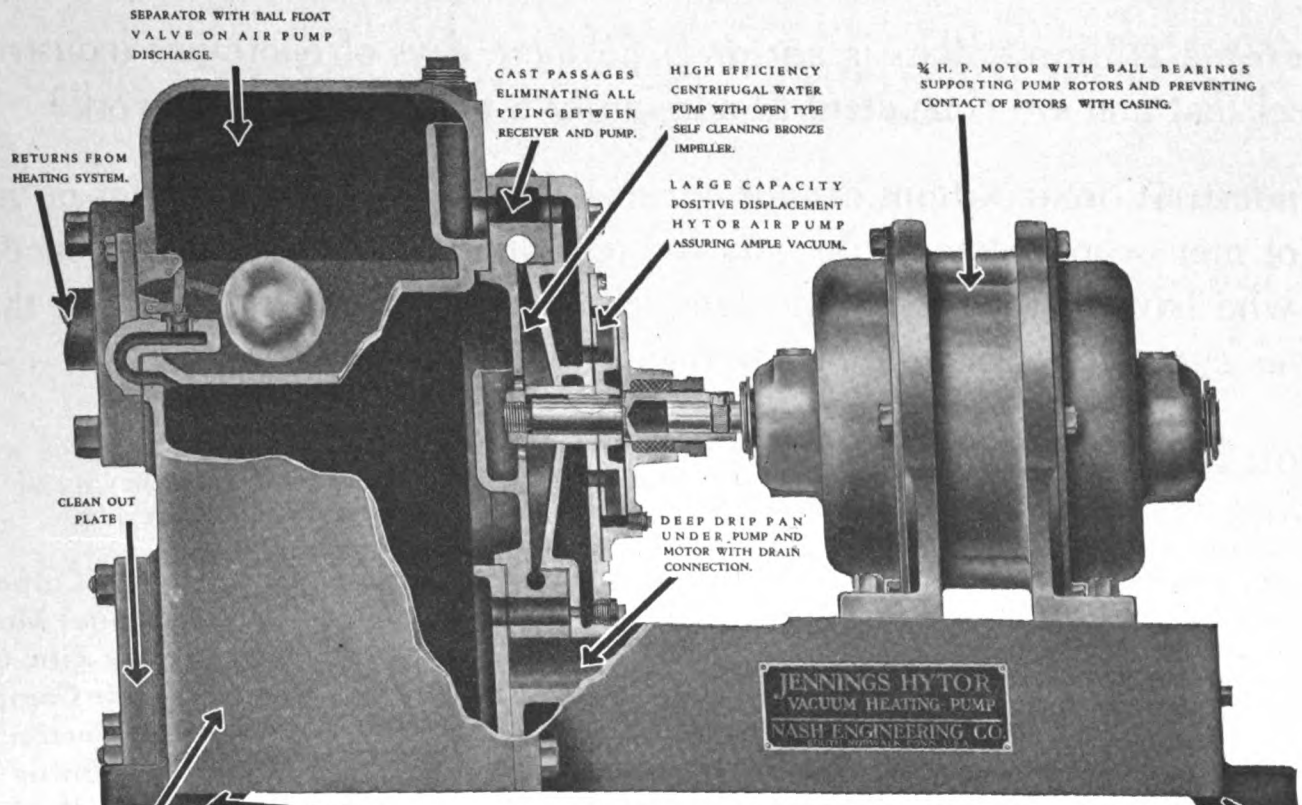
The Only Complete Course in Industrial Management

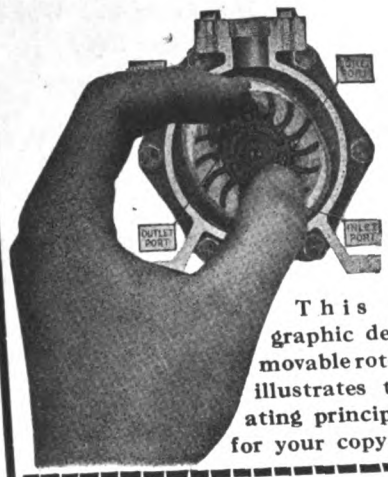
Copyright, 1922, Industrial Extension Institute.

Digitized by Google

THE COAL SITUATION DEMANDS EFFICIENT HEATING

EFFICIENT HEATING DEMANDS THE JENNINGS PUMP





This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

9

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps
- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps

NAME .....
POSITION .....
COMPANY .....
ADDRESS .....

Now is the time to prepare your heating facilities to meet the conditions of the coming winter.

The installation of a Jennings Return Line Pump in connection with your system means quick heat in the morning, at the most isolated radiators, and in zero weather. It means a positive control of heat at all times and the elimination of radiator noises. It means an economy in fuel, that, according to our customers, makes this piece of equipment a real dividend paying proposition.

Jennings Pumps are made for any size installation. The small unit here illustrated has ample capacity of 5,000 sq. ft. of equivalent direct radiation. Because of simplified design, in connection with quantity production, this outfit is being sold at a price never before possible in a pump of this capacity.

The pump incorporates all of the high grade workmanship and material characteristic of our Jennings equipment. It is equipped with solid bronze air rotor, rotor housing, water impeller and shaft.

In this unit all piping complications have been removed, and it is only necessary to make three connections:
1. The return main. 2. The water discharge. 3. The air discharge.

While the new compact "M" type is furnished in one size, our well known Jennings Pumps in separate tank design, as recommended for larger capacities, are furnished for any size installation.

Many thousands of these pumps have been installed and have given universal satisfaction.

NASH ENGINEERING CO.
SO. NORWALK, CONN. U. S. A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

Multiplying Manpower

LITTLE more than a century ago, man-power was the predominant source of energy. Man used the power of horses and oxen, and he utilized to some extent the power of streams and waterfalls; but in the aggregate, man's own energy output was the measure of the power available: if any industry employed fifty men, then that industry enjoyed the amount of energy those fifty men could exert, and no more.

Based upon exhaustive tests, it has been shown that the average energy output of the American workman in an eight-hour day is one-tenth of a horsepower. From census figures of the United States, we know that there are roughly forty million of our population, today, engaged in gainful occupations.

Even if we assumed that clerical workers could equal the energy output of manual laborers, this whole working population can produce but four million horsepower, available only one-third of each twenty-four hours. Suppose, then, we had no steam power, no electric power, no automobiles, no oil engines; suppose we had to use the methods of a century ago—let us take a concrete example:

In the past year, our railroads handled in round numbers four hundred billion ton-miles of freight, utilizing mechanical energy, and employing two million men. To handle that same amount of freight under the methods available a century ago, would have required the labor of *one-and-one-quarter billion men*—more than one hundred times our total population at that time—almost twelve times our total population today. Each of those two million railroad men, then, is accomplishing today by the aid of mechanical energy, as much as six hundred and fifty men were able to do a century ago. And, at the same time, the cost per ton-mile has dropped, from two dollars to about one-and-one-half cents.

Man's productive labor multiplied six hundred times, and the cost of that production reduced to a fraction of its former cost—and this in the short space of less than a full hundred years! And all through machinery, mechanical energy, *power*.

Iron and steel were produced a century ago, and with but little more than one-tenth horsepower per man employed; today, we develop forty-two horsepower for each employe—four hundred and twenty times as much. Flour mills have been grinding grain since the early days of history; today, every employe in such a mill has two hundred times his own energy-output to work with. And so for every industry.

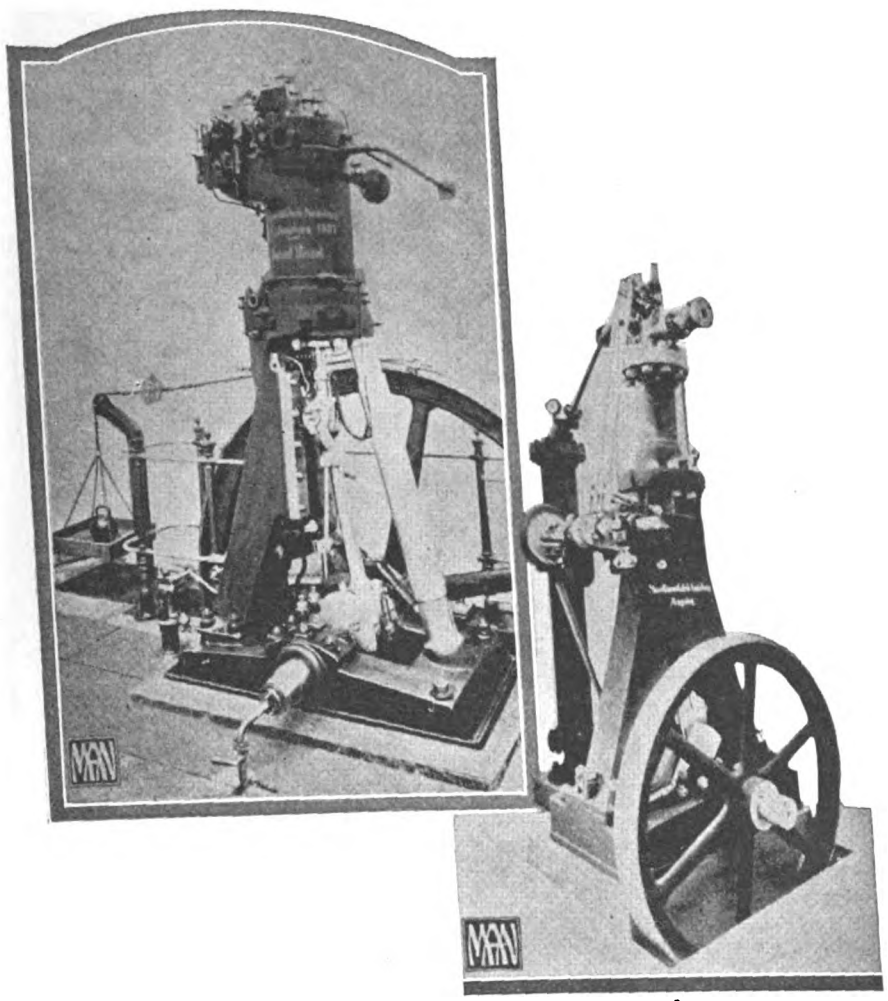
Wherever we turn, the keynote is power. More and more, "labor" is coming to mean attendance upon a machine which actually performs the labor. And the more cheaply we can produce power, the more far-reaching will be its benefits; for cheap power, in the final analysis, is the solution not only to industrial ills, but to the social and political ills of the world.

Digitized by Google

American Development

How Ignorance and Prejudice are Being Conquered

By W.



At the right is the first experimental Diesel engine, and above at the left, the first commercial Diesel, of 25 H. P., built in 1897. (We are indebted to SPEED-UP for their courtesy in loaning us these illustrations; and to the Maschinenfabrik Augsburg-Nurnberg, Germany, who built these pioneer engines.)

AT the time of going to press, the latest available quotations for spot steam coal run from $2.50 to $6.50 per ton; the price of fuel oil, from 2¾ to 5 cents per gallon. Translating both of these into average cost per heat unit, we can buy roughly one million British thermal units in the form of coal for sixteen cents, or the same number of heat units in the form of oil for twenty-five cents.

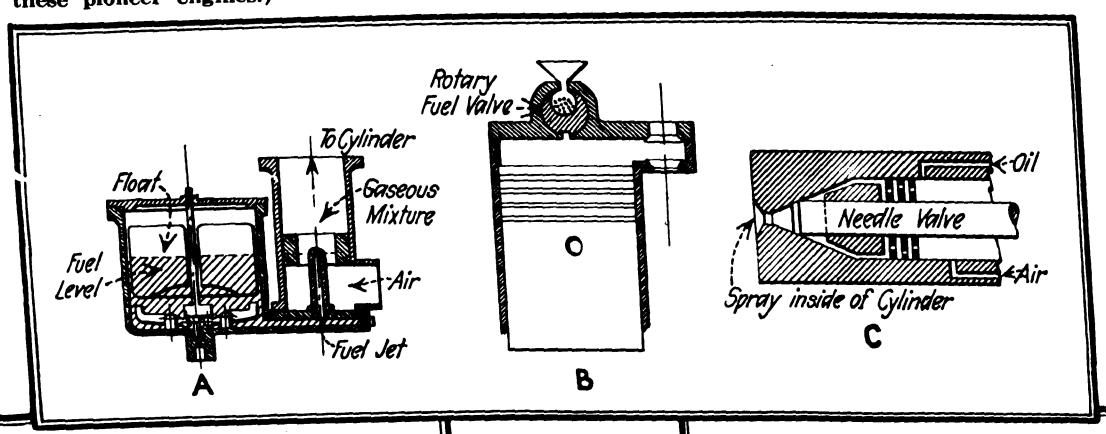
It may seem a far cry from the title of this article to an analysis of the cost of B. t. u.'s —but this article is intended especially for industrial executives and industrial power plant men; and the latter are interested in B. t. u. costs, while the former are beginning to sense the relation between these and their uncomfortably high power costs.

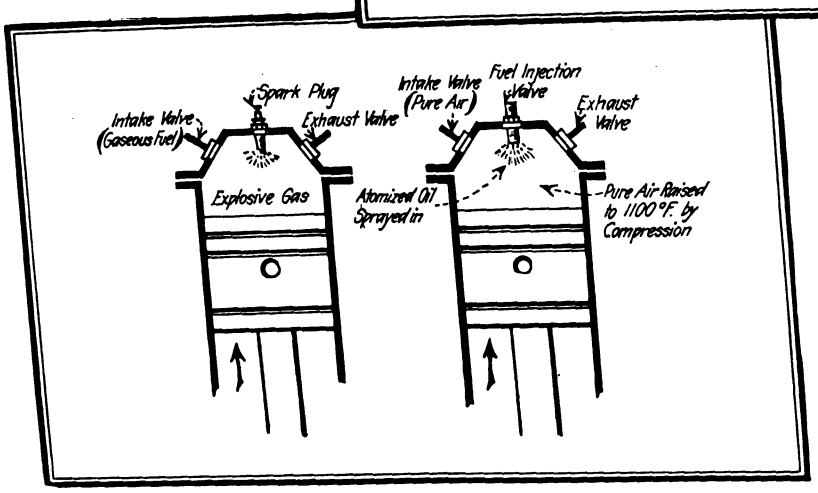
To repeat, then:—Today's dollar will buy an average of six and a quarter million B. t. u.'s if spent for coal, or four million B. t. u.'s if spent for oil.

Assuming that we buy our fuel in the form of coal, burn it under boilers to generate steam, and drive an engine with the steam, we can (if we are blessed with a several-thousand-horsepower turbine installation) get some sixteen per cent thermal efficiency from it. But if we average the performance of industrial power plants in this country (which is not over 7 per cent) *we actually are converting less than* 437,500 *of our original six and a quarter million heat units into useful work.*

Suppose, on the other hand, we buy our fuel in the form o oil, and burn it in a Diesel engine. Then, although our dollar buys only four million heat units, *we are getting over* 1,200,000 *of these units in the form of useful work.* In other words, the Diesel engine—within its limitations, to be taken up in the course of the discussion—furnishes power for approximately one-third the fuel cost of an equal amount of steam power. An

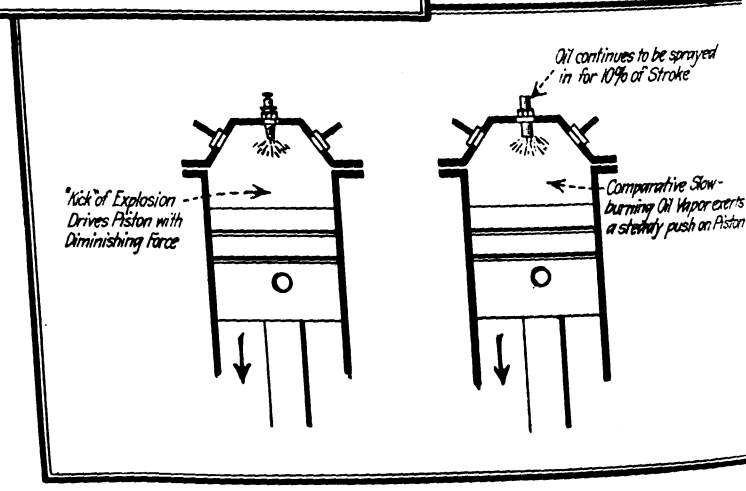
The gasolene carburetor, which can vaporize only gasolene or gasolene and kerosene mixed, is really a miniature gas machine. At the center is shown Doctor Diesel's original design of a rotary fuel valve for powdered coal, while at the right is a cross-section of a typical Diesel engine fuel valve—essentially an atomizer.





AUTOMOBILE VS. DIESEL

At the left the events occurring in a gasolene engine cylinder just prior to the end of the compression stroke, and on the right the Diesel cylinder at same point in its cycle.



AUTOMOBILE VS. DIESEL.

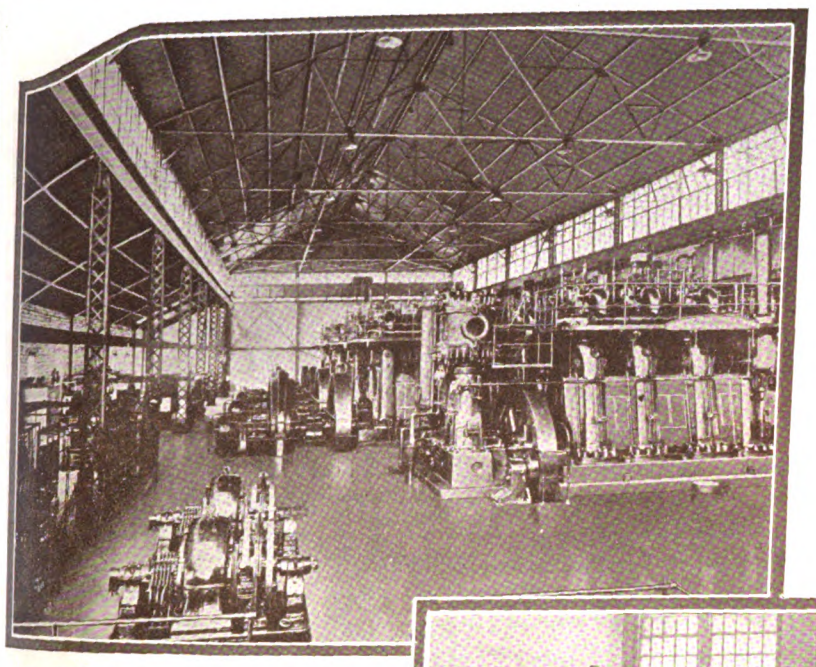
The contrast in the cycle of events between the well-known gasolene engine and the Diesel engine—the piston in each case having passed top dead center and begun the power stroke.

Digitized by Google

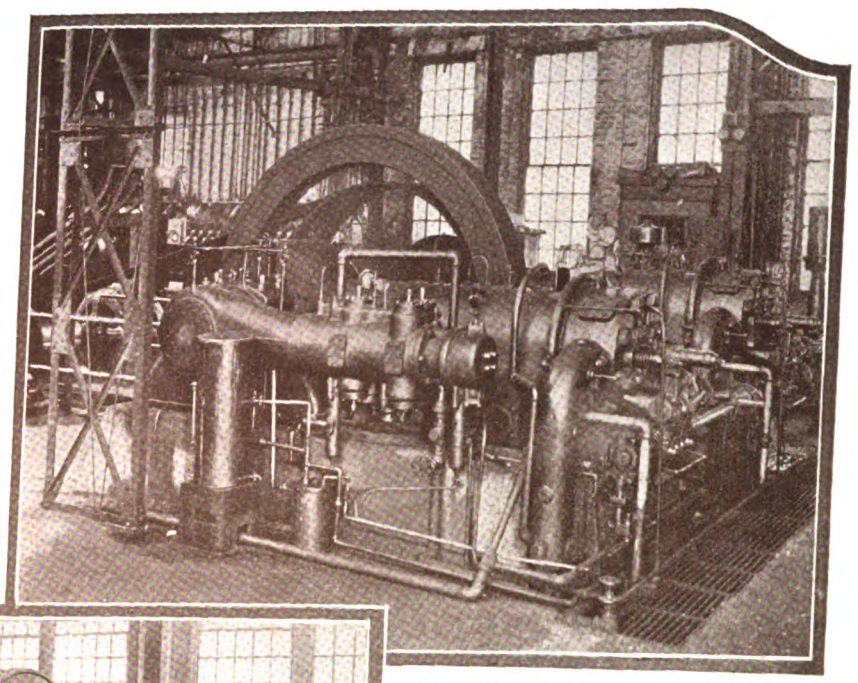
of the Diesel Engine

by this most Efficient Prime Mover

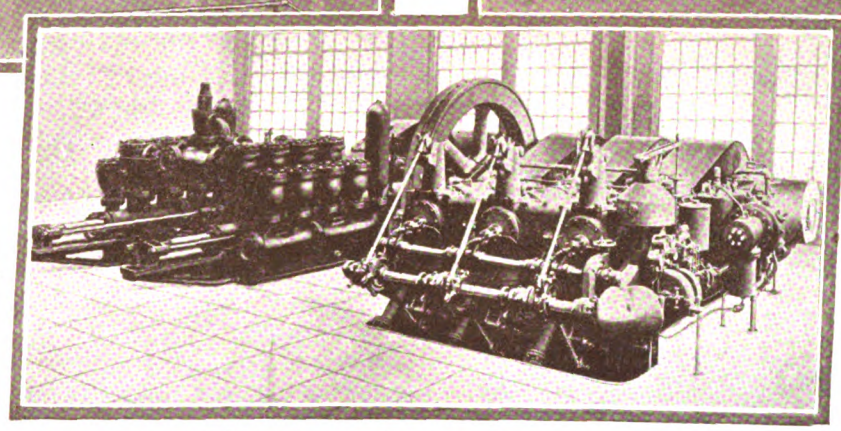
THOMSON LEES



One of the first large-size Diesel engine plants built in this country. In it are two original 1250 H. P. engines bought from Carels Freres, Belgium; two duplicates of these, built by the Nordberg Mfg. Co.; and two 750 H. P. Diesels connected to air compressors. This plant is at Tyrone, N. M., and supplies mine and town with light and power.



A 150 H. P. Diesel engine in the plant of the National Transit Pump & Machine Co. This company, in common with most Diesel manufacturers, uses its own product in power generation.

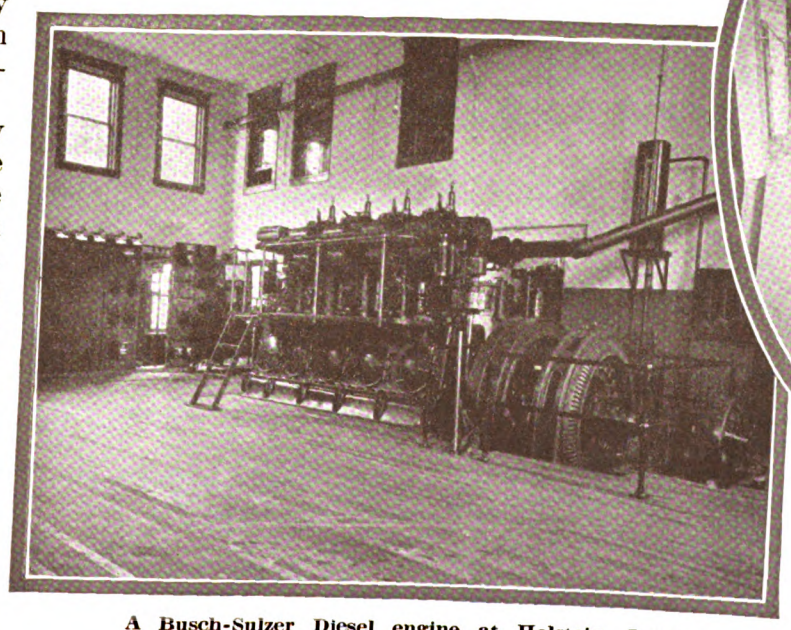


An Allis-Chalmers Diesel engine, operating plunger pumps at the oil pipe line pumping station of the Yarhola Pipe Line Co., Oklahoma.

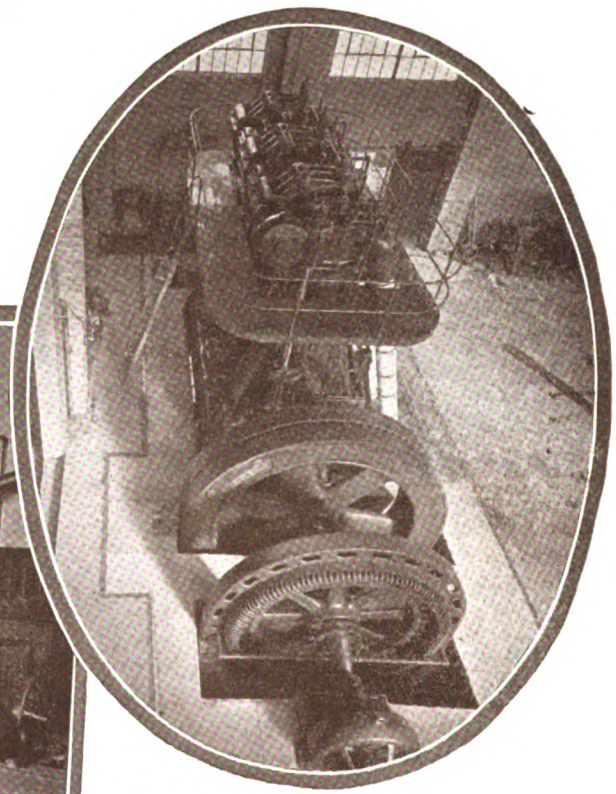
these figures, by the way, are not theoretical, but are taken from actual operating conditions in going plants.

To understand why and how the Diesel engine obtains a fuel-to-power-efficiency from four to eight times that of an industrial steam power plant, and to explain why its recognition in this country has been such a slow process, it will be necessary to take up briefly some of the salient points in the history of power development.

The field first successfully invaded by the Diesel engine in this country was the marine power field. The elimination of coal storage space, the saving of engine-and-boiler-room space, and the general advantages of liquid fuel, all combined to give the Diesel engine a hearing from marine interests. In the central power station, too, this engine began to receive attention; probably because the central power station must sell its power, and is thus thoroughly awake and ready to investigate anything which promises more economical

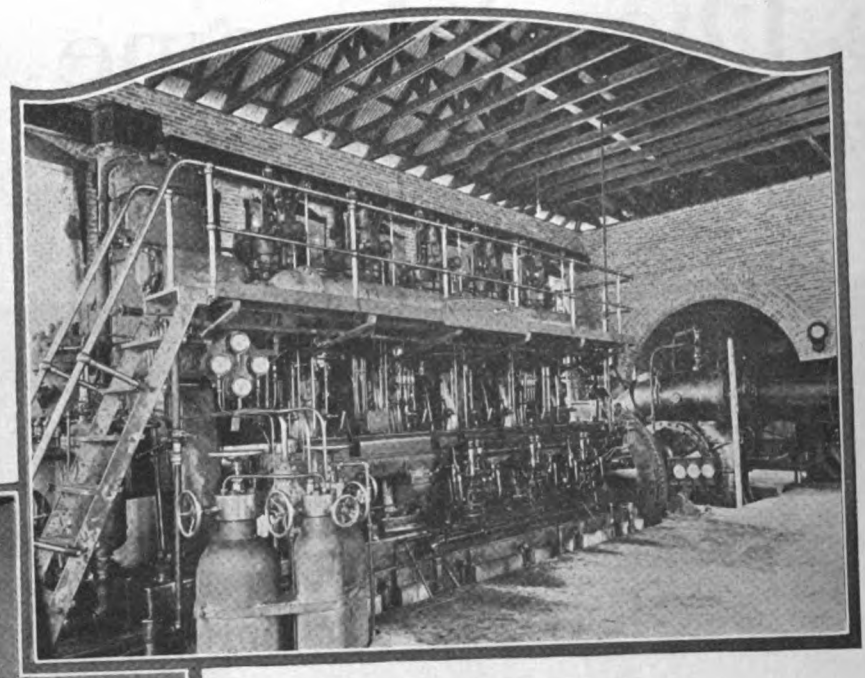


A Busch-Sulzer Diesel engine at Holstein, Iowa. Note the typically clean engine room, and bear in mind that there is no boiler-room or coal storage in the background.

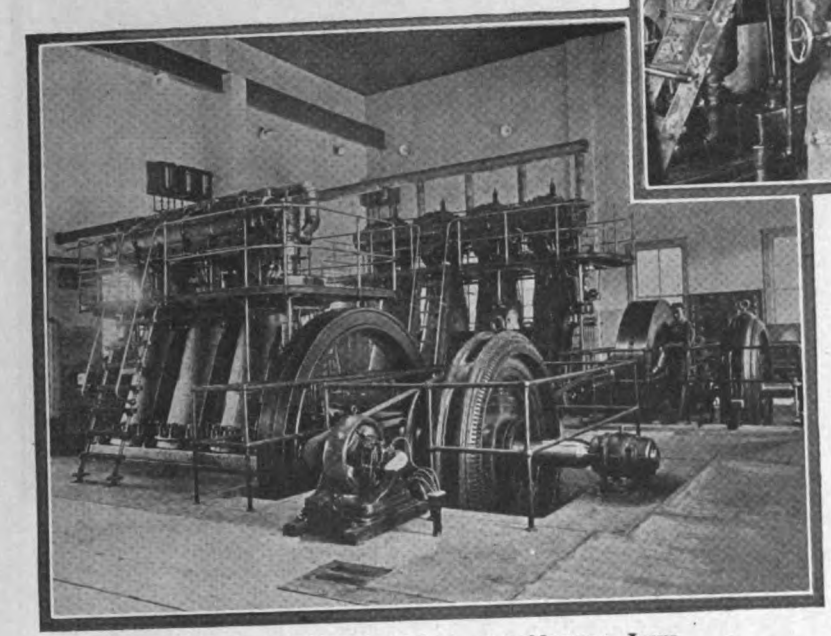


A "bird's-eye view" of the engine which appears on the cover of this issue—a 520 H. P. Diesel Engine recently installed at the municipal power plant at South River, N. J., where it replaced a producer-gas installation.

Digitized by Google



Pumping water to irrigate 25,000 acres of land at Mission, Texas. This 550 H. P. Nordberg Diesel engine saved more than $400 in fuel in its first four days, after replacing an oil-fired steam installation.

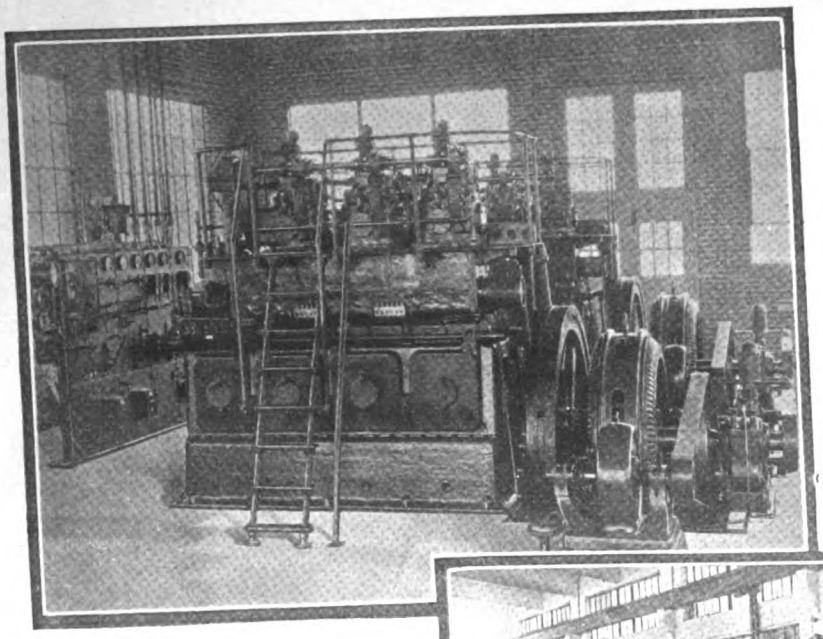


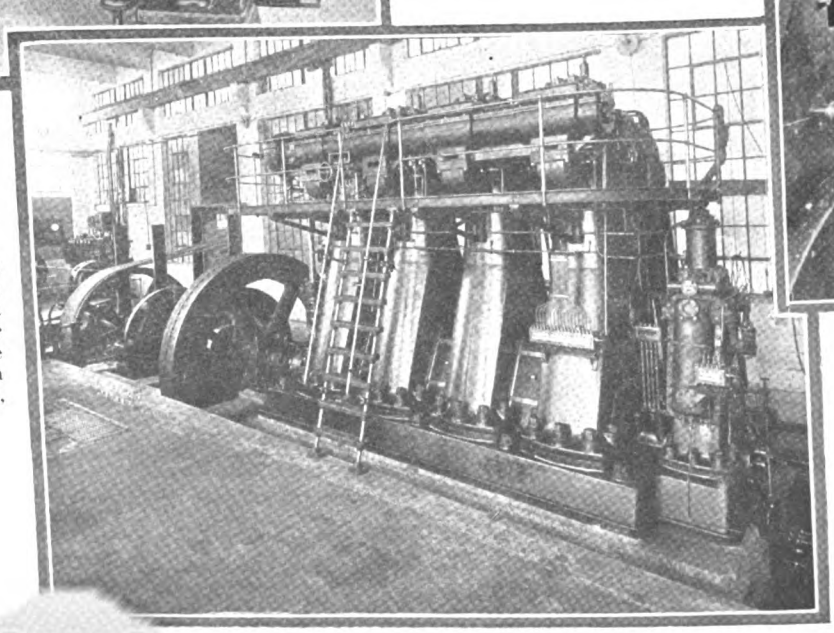
The Municipal Power Plant at Algona, Iowa. Starting with one 200 H. P. Fulton-Diesel in 1918, this plant installed a second, of 425 H. P., in 1920, and in April of this year (not shown here) a third—a common occurrence in Diesel engine experience.

power. The industrial field, strange as it seems at first glance, stubbornly resisted the idea from the start.

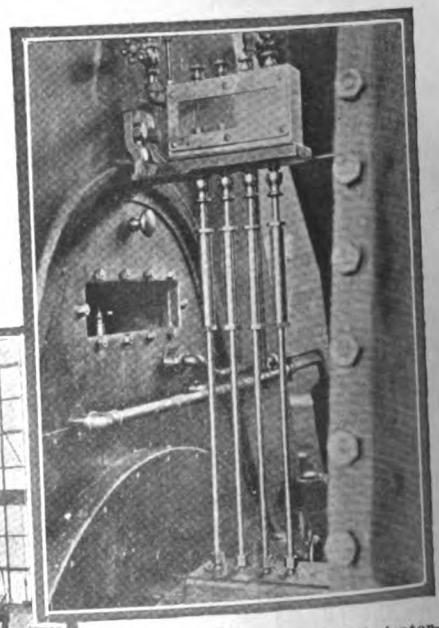
It must be remembered, however, that the industrial power field is steeped, for the most part, in the traditions of steam power; and, as a group, industrial power users are so slow to adopt improvements that this one factor alone is responsible for the low average efficiency of 7 per cent in industrial power plants as a whole—where better methods and available equipment would, if utilized, easily show an increase of from two to four per cent. Until recently, the average plant executive had little interest and less knowledge concerning his power. He left that to his power engineer, and the latter was a dyed-in-the-wool coal and steam man; nor did it occur to the executive to look upon power as a commodity which must be produced economically, but rather as a raw material which had to be had, at whatever cost. But those "good old days" passed when prices tumbled, and now-a-days power costs are among the very live topics at directors' meetings.

There is a rather prevalent impression among laymen that the internal combustion engine was conceived only after the steam engine had been made practical; that it was the result of a seeking for a better





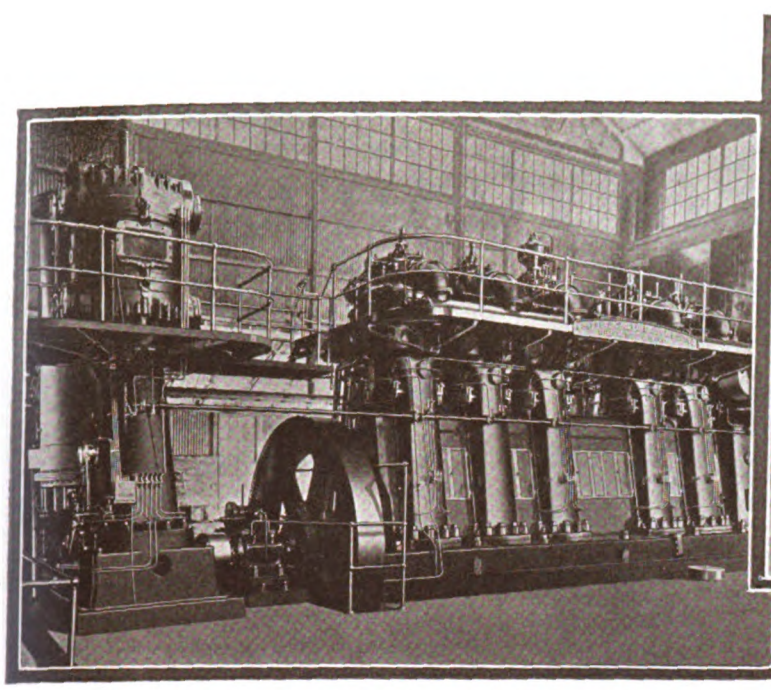
Above—Two "Standard" Diesel Engines of 150 H. P. each, at the West Point, Nebraska Municipal Light and Water Plant; where they reduced the fuel cost from $60 to $8.39 a day—with coal at $9.15 a ton, and oil at 6½c a gallon.



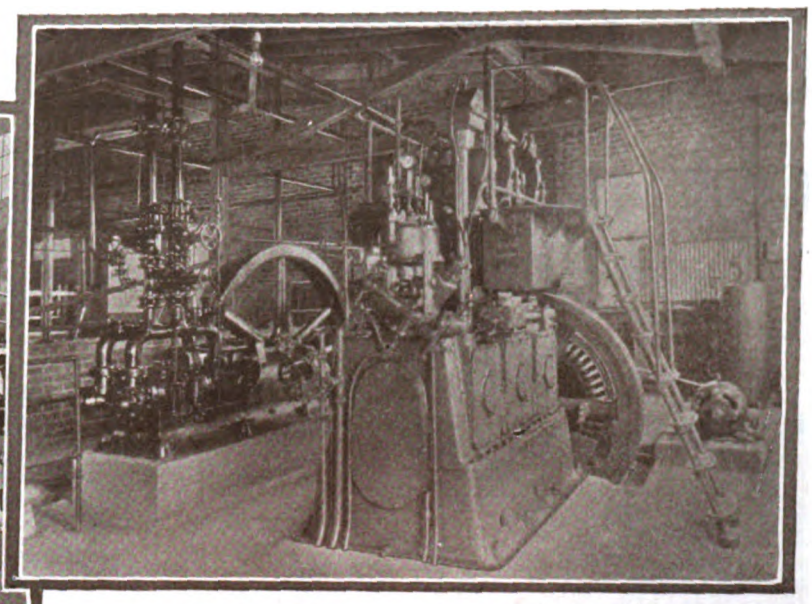
Close-up of sight-feed lubricator—one of the comparatively few and simple things the Diesel operator keeps an eye on, in contrast to the many dials and gauges of a steam plant.

A typical flour mill installation:—585 H. P. Fulton-Diesel at the Standard-Tilton Milling Co., Dallas, Texas, in operation since December, 1919.

Digitized by Google



A Nordberg-Carels Diesel of 1250 H. P. at the Morenci Branch, Phelps Dodge Corporation. This engine, normally running at 180 R. P. M., is governed automatically by the compressed-air demand which it supplies, and is often cut down to 55 R. P. M.—an illustration of the Diesel's flexibility.



At the Bucyrus Ice & Cold Storage Co., Bucyrus, Ohio; a 100 H. P. "Standard" Diesel engine which is claimed to save $1.03 per ton of ice produced, over the former method, of buying power from a central station.

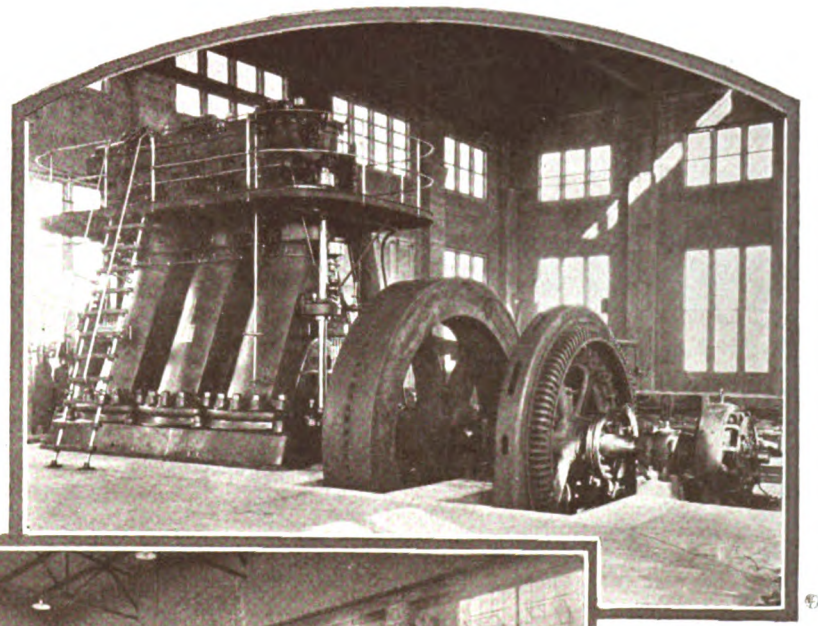
power unit than the steam engine. On the contrary, internal combustion engines had been built and used long before Watt's time. But the defects of these early types were so great that, when Watt made the steam engine a practical thing, interest in power development became centered upon steam; with a resultant lapse in the development of the internal combustion engine.

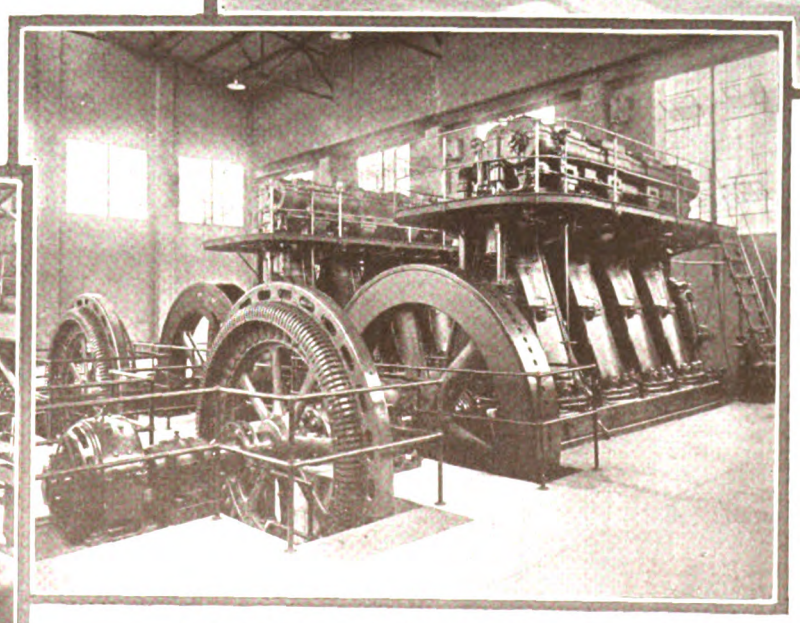
The fuel suggested for use in these early engines was gunpowder; but defects in construction prevented any tangible results with this rather capricious "fuel." After men had learned something about the distillation of coal, a better fuel became available, and several internal combustion engines were developed for the use of coal gas; these really being the forerunners of our modern gas engine.

By the time (1876) Otto's silent engine was exhibited at the Paris Exhibition, creating a great stir by its radical improvements, experimentation had already begun with the use of volatile liquid fuels for internal combustion engines. These experiments finally led to our modern gasolene engines.

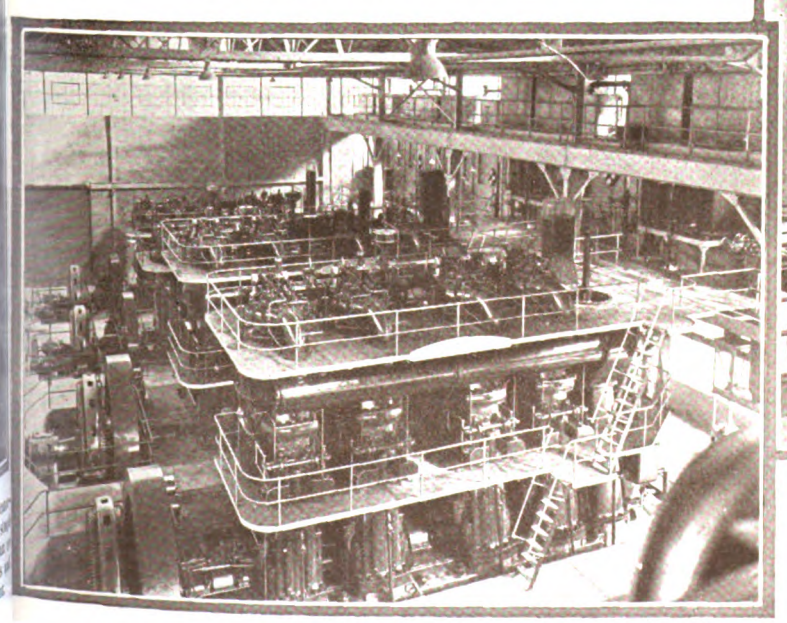
(*Continued on Page 54*)

This Fulton-Diesel (below) of 500 H. P., installed in 1919 at the Miami, Oklahoma, Municipal Plant, replaced steam equipment. A second Diesel was installed here in August, 1921.





A typical cement plant installation Fulton-Diesel at the Texas Portland Cement Co., Houston, Texas. One engine installed in May, 1916, the other in August of that year.

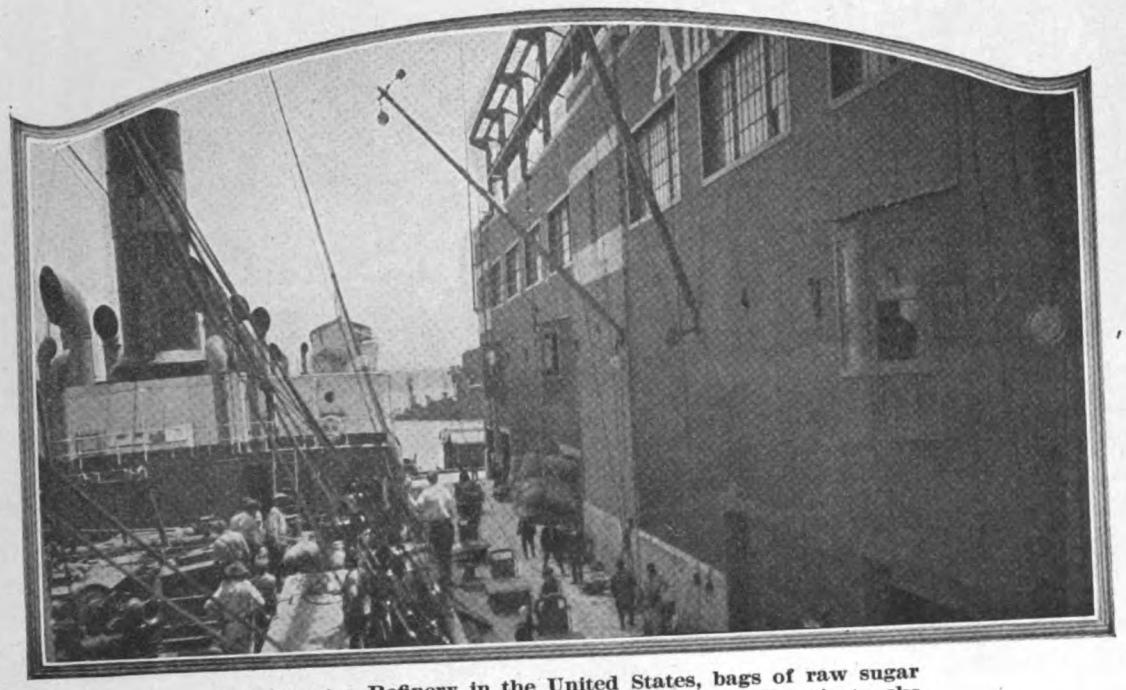


At the Copper Queen Branch, Phelps Dodge Corporation, Bisbee, Arizona; two 1250 H. P. and two 2,000 H. P. Nordberg Diesel engines—the latter having the largest power cylinder built in this country to date—28" x 44". These "big ones" weigh some 350 tons.

Digitized by Google

Material Handling in the World's Most Modern Sugar Refinery

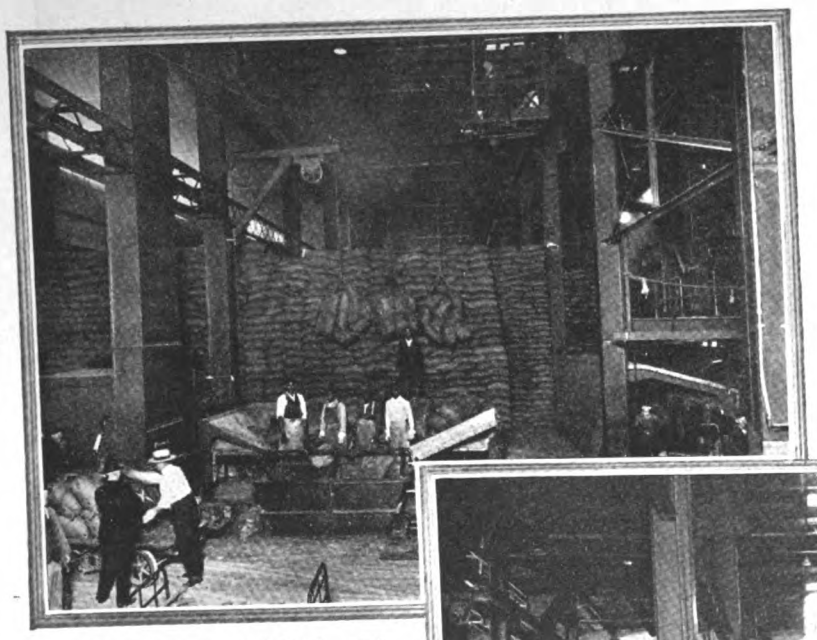
By Homer L. Rank



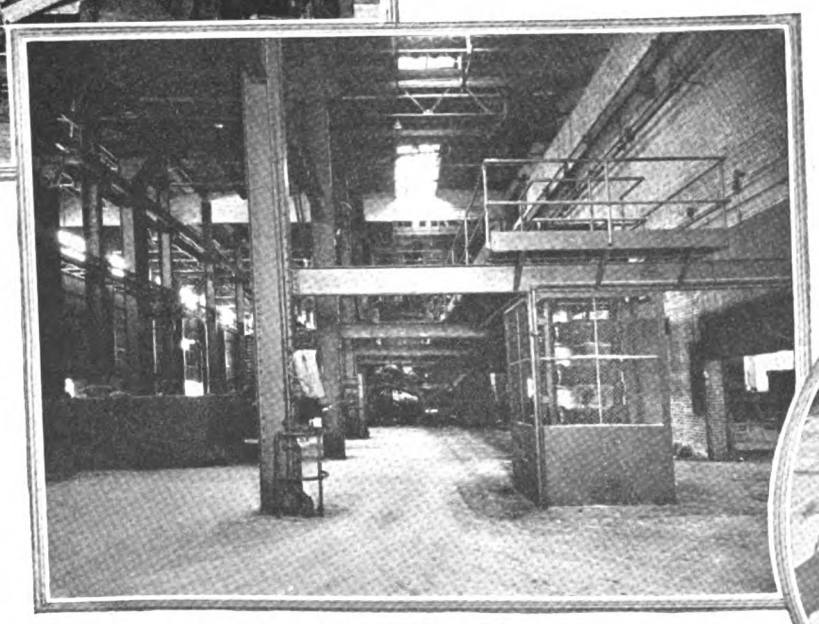
Arriving at a Refinery in the United States, bags of raw sugar are unloaded by means of the ship's winches. Electric trucks then haul the bags over Government scales, where they are carefully weighed, for import duty.

FOOD, or high explosive? Sugar, or gun-cotton? How many of you who read these words realize the slight difference, from a chemical standpoint, between one of the most important foods and a much-used explosive? For the chemical formula for sugar is C_{12} H_{22} O_{11} while that of commercial gun-cotton is C_{12} H_{20} O_{10}, combinations of nature's elements which vary mainly in the proportion of hydrogen content, though used for widely different purposes —and certainly contrasted results!—in our daily lives.

Naturally, the factories in which these closely related chemical compounds are prepared, differ greatly. 9,280,000,000 pounds of sugar were refined and consumed in the United States, in the year 1921. The most modern plant in the world, for refining cane sugar has recently been completed and put in operation at Baltimore, Maryland. For over 2,700 years sugar for food has been extracted from the juices of certain plants, with varying degrees of purity; but with constant improvement of method and process during the passing years. Today, the demands of our modern civilization and

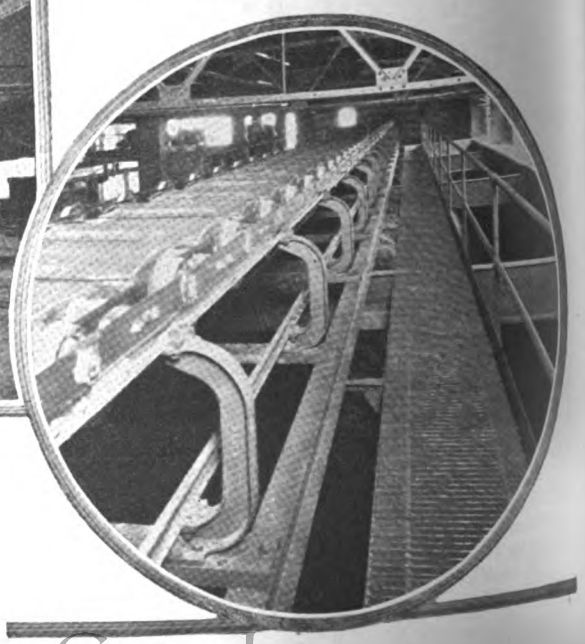


After being weighed and sampled (man with straw hat is a sampler), the bags are hoisted by high-speed electric cranes and either placed in storage piles, or deposited upon cutting tables to be opened. Crusher in foreground; conveyor directly under it, and to the extreme left.



Sugar may go directly into refining process, (see conveyor under skylight), or may be carried to storage bin by conveyor in the foreground. Returning, this conveyor brings sugar from storage, and deposits it into either of the two elevating conveyors, first mentioned.

Another view of the long conveyor shown in picture (3), showing raw sugar being dumped into a three-million-pound storage bin. Note the sugar, piled like so much sand, in bin below the walkway. This bin "feeds" the refinery at night.

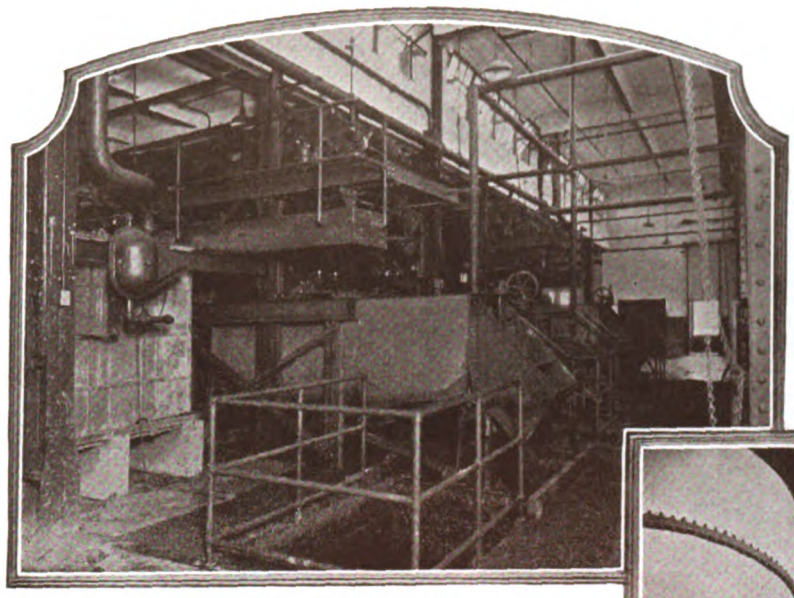


Digitized by Google

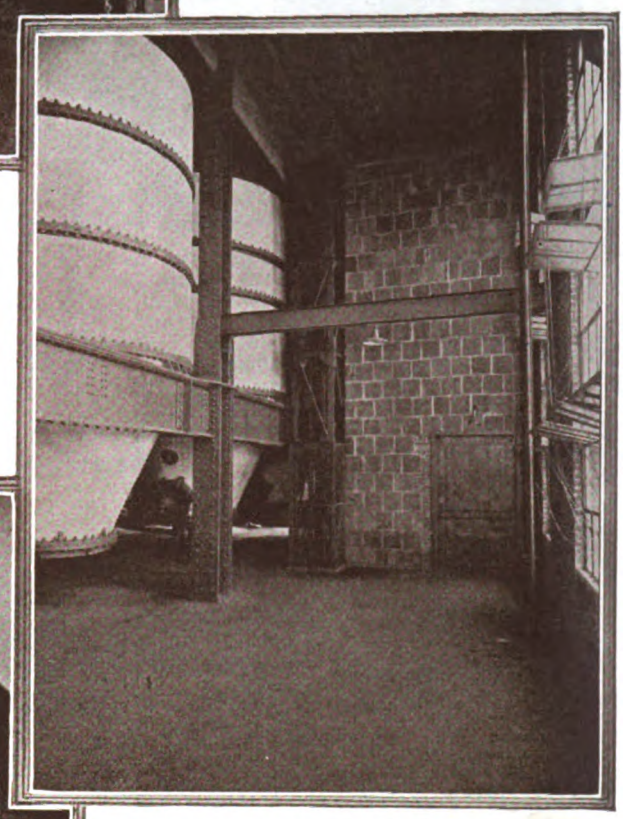
scheme of commercial economics are such that—in foods—we must have the highest grade of product, uniform in quality and purity, yet produced at a minimum cost.

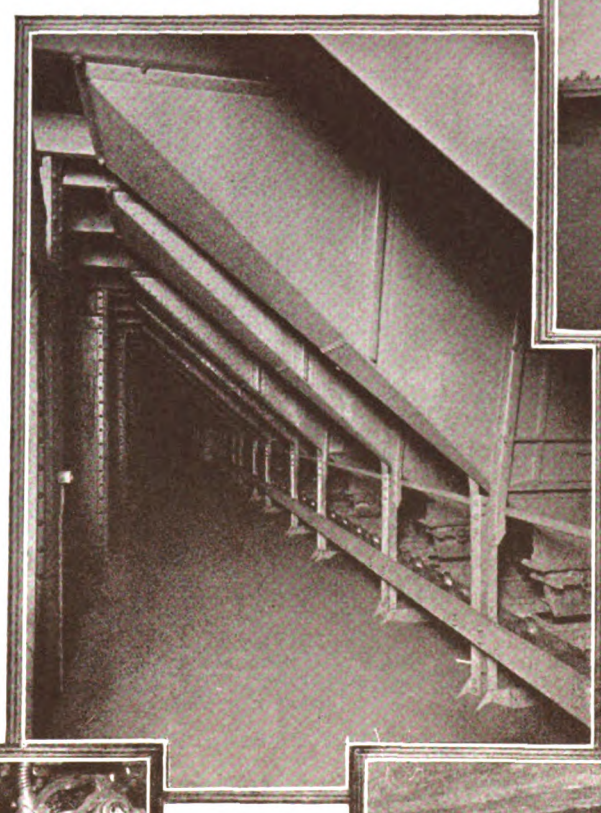
To obtain these uniform results at low cost, the process must be mechanical as far as possible, particularly the conveying of both raw and refined material between process units, machinery must now do the work, which, for centuries, has been done with human hands. In the Refinery above referred to, every effort has been made to minimize the amount of non-productive labor required to carry on the process of preparing sugars for the discriminating American housewife. As a matter of fact, every grain of sugar passes through the entire refining and packing process, without being touched by human hands. When designing and building this Refinery, no reasonable expense was spared for material-handling equipment and automatic devices. This does not mean that money was literally "thrown away"—on the contrary, months of time and study were spent in reaching decisions regarding the *judicious* expenditure of capital, for equipment that would "stand up" under the unusually severe treatment ordinarily given mechanical equipment in a plant of this character.

For the sugar-refining process is continuous; the machinery must function twenty four hours a day, with occasional stops on Sundays. In the new refinery at Baltimore,



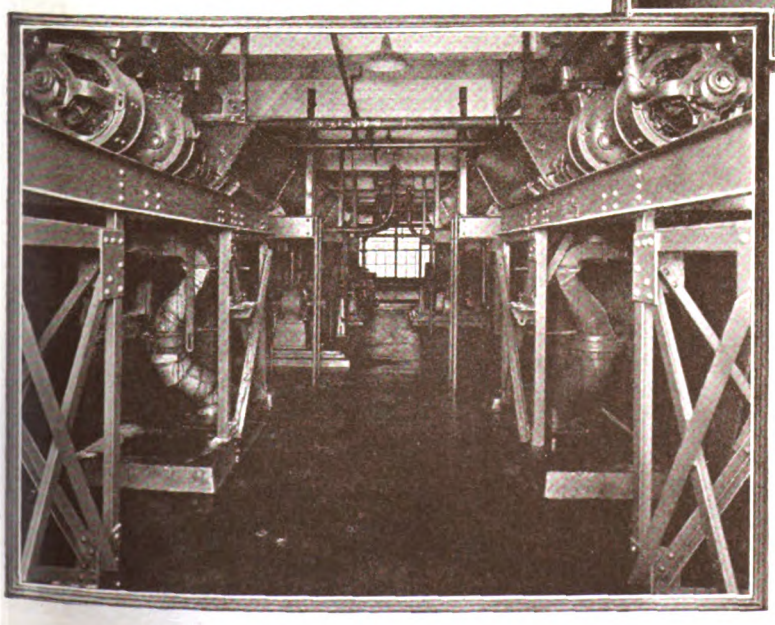
Raw sugar, started through the refining process, is elevated to the 7th floor of the "Wash House," which, as the name implies, is the "laundry" for this sugar. Note the two tanks (center) into which either of the two conveyors dump.



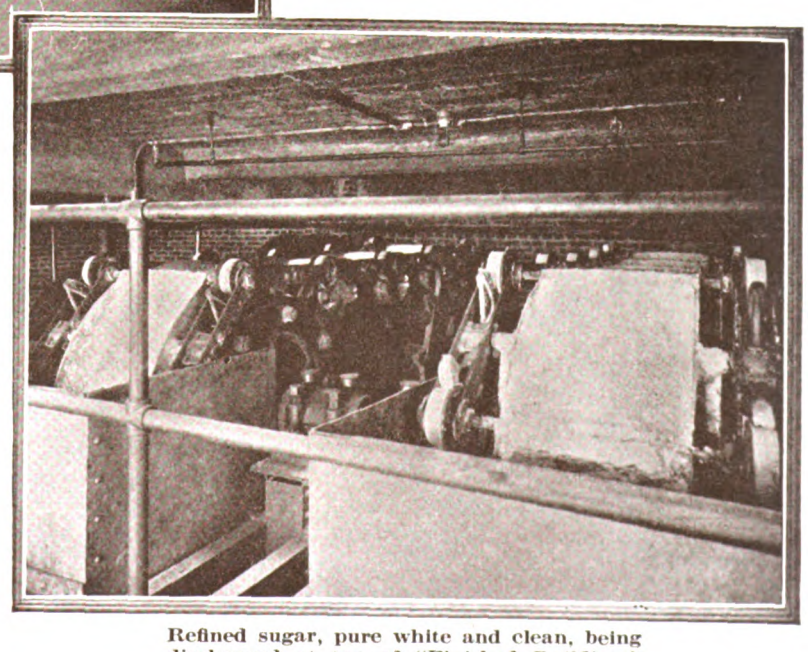


After being "washed," the sugar now in liquid form, must be carefully filtered. Tank shown contains 35 tons of the filtering medium—bone charcoal. Note close clearance of conveyor between tank and wall; four conveyors handle all the char used.

After 48-hour periods of use, the char must be revivified by washing and re-burning. A continuous stream is conveyed from the hoppers shown here, and elevated to the top of tanks shown in preceding illustration, a system never previously used in a refinery.

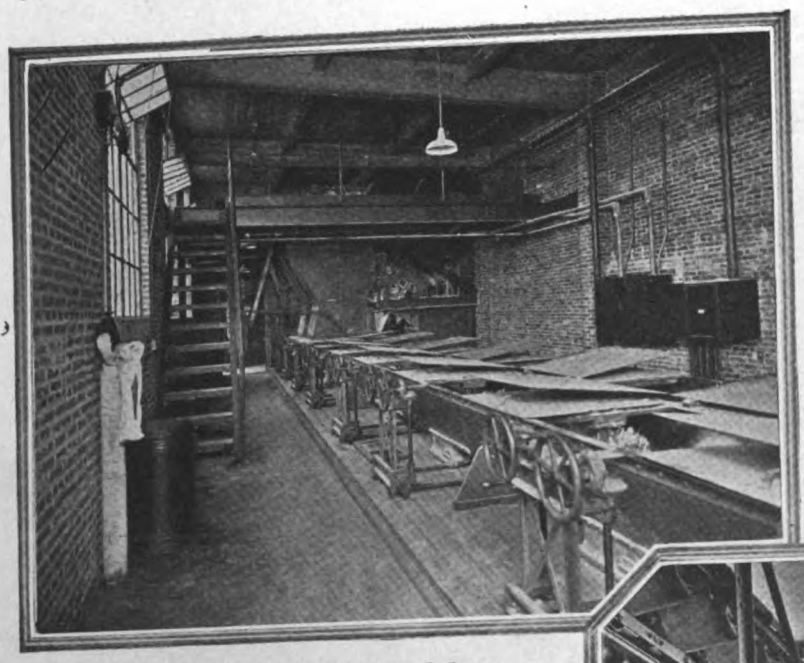


Special spiral conveyors, shown here, carry refined sugar (containing a small percent of moisture) from centrifugal machines to aluminium bucket conveyors, which in turn convey and elevate to the "Finishing Building."



Refined sugar, pure white and clean, being discharged at top of "Finished Building." **Note close clearance overhead, due to structural limitations of the roof.**

Digitized by Google



Moist, refined sugar, discharged from either of the aluminum bucket conveyors in the background, is distributed over the storage bins by two spiral conveyors. Note the convenient operating mechanisms for gates in both troughs.

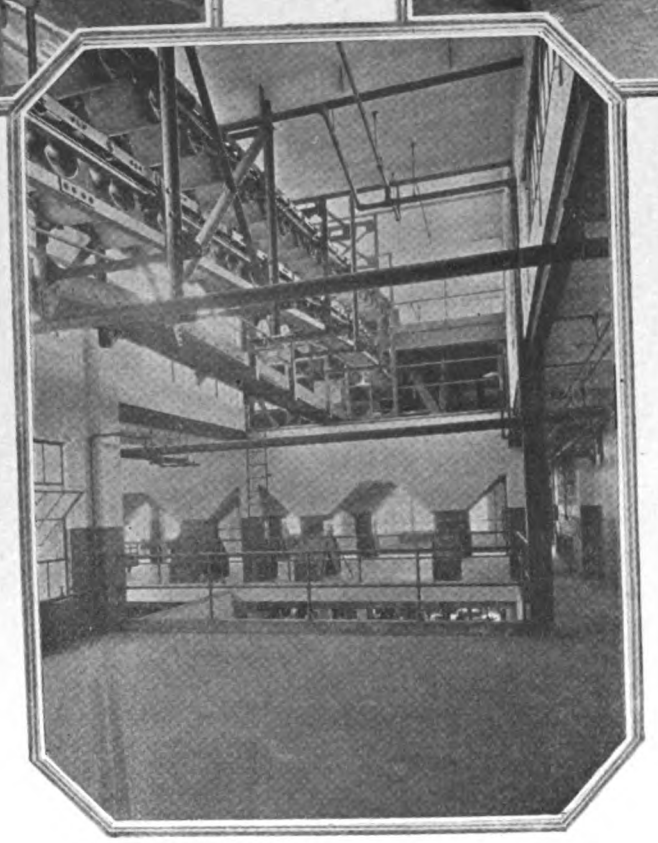


After being dried and screened into the several commercial sizes, sugars are deposited into a three-million-pound storage bin, from whence it is packed in barrels, bags or cartons. View shows aluminum bucket conveyor on its way from storage bin to carton filling department.

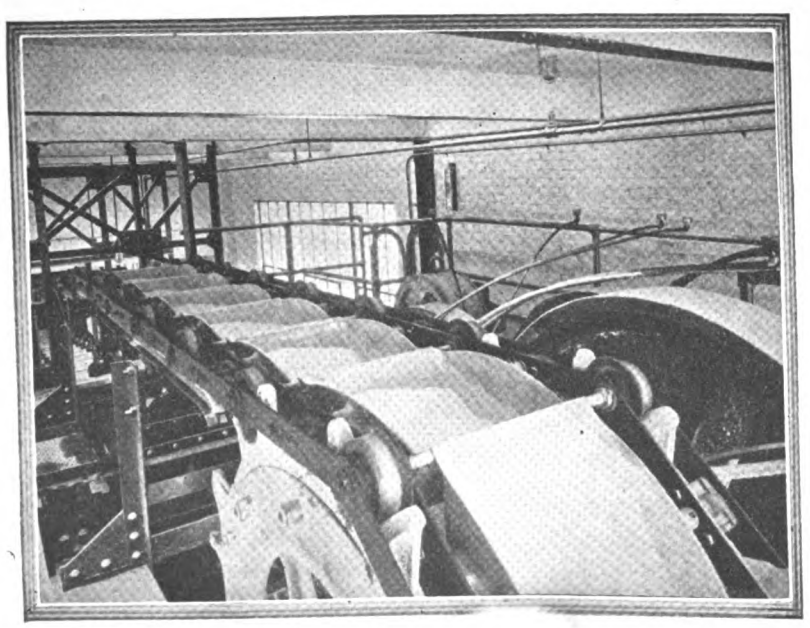
there are material-handling devices which have never been previously used for the purpose, in this country, and some which are totally new to the sugar refining industry, world over. There can be no loss of time or delays to the various costly processing units, due to faulty or inadequate connecting links—the conveyors—and in this refinery all the elements are effectively coordinated by the conveying system to be described, and shown in the accompanying protographs.

Raw sugar (resembling in appearance the "old fashioned brown" sugar, with which most of us are familiar), reaches this modern Refinery in 325 pound burlap bags, having been shipped by steamer from Cuba, Porto Rico, the Phillipines, Java, and other tropical countries. The bags are unloaded by ship's winches and gear and landed upon storage-battery trucks on the dock. Each truck load is accurately weighed, once over Federal Government scales (for import duty) which are tested hourly, and again over the refinery scales, the contents of each bag being sampled after weighing. From this point the sugar may take either one of two courses, into temporary storage in bag or in bulk, or go directly into the refining process. Bags which go into storage are lifted from the trucks by high-speed electric cranes, three "slings" to each crane, and seven bags in each "sling." The raw sugar warehouse is of

(Continued on page 51)



Having traveled along under storage bin, the sugar is elevated 110 feet and now traverses the span between finished department and parking room. Note flood of light and total absence of dust—the photograph has not been retouched.



Dry, refined sugar, perfe[illegible]arg-ing from aluminum [illegible]nto bins over carton-filling [illegible]te of one hundred thou[illegible]r.



The huge task of producing and selling CLEANLINESS is being successfully performed, mechanicaly, by the American Sugar Refining Company, in this remarkable group of buildings.

Digitized by Google

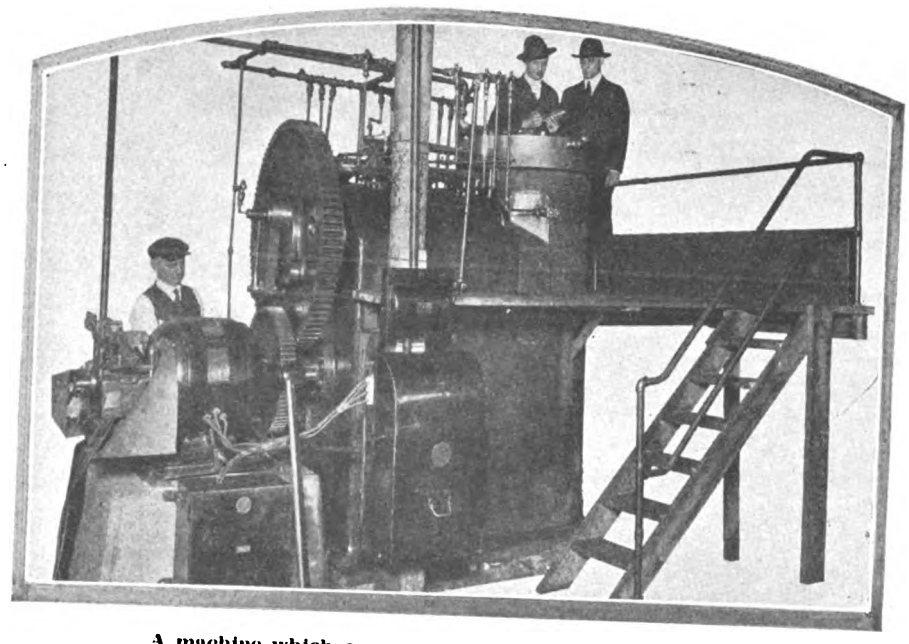
Cutting All the Teeth of a Gear at Once

THE machine here shown differs from the usual type of gear cutting machines in that it cuts *all* or a *multiple number, of teeth* in a gear or similar product at one operation as distinguished from cutting one tooth at a time as is ordinarily done on standard machines.

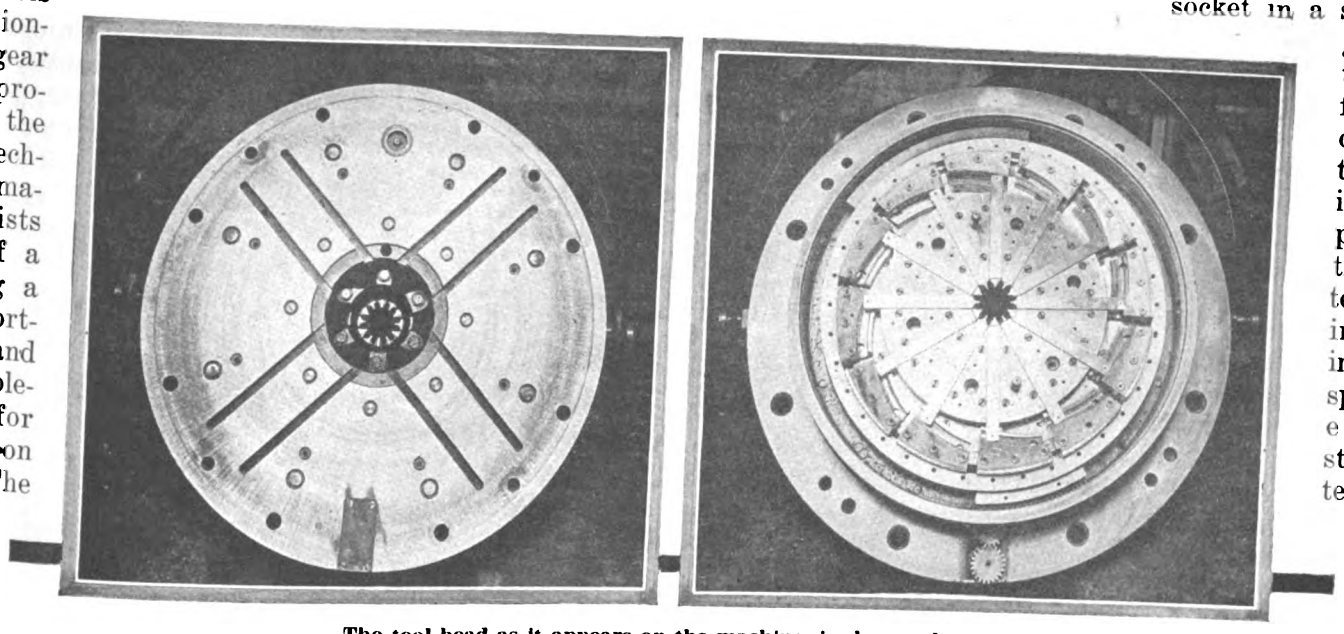
The essential member of the machine is a special tool head which consists primarily of a series of radially disposed tools spaced about the circumference of the blank to be cut.

This machine operates in the same manner as an ordinary vertical shaper, except that the tools are held stationary and the gear blank is reciprocated past the tools. The mechanism of the machine consists essentially of a ram carrying a blank supporting arbor and the multiple-tooled head for operating upon the blank. The frame of the machine is a casting of rectangular box section with a vertical cylindrical portion at one end. The ram is mounted in the center of the cylindrical part of the frame and the tool head is mounted above the ram at the top of this portion. The crank shaft which drives the ram is journaled near the top of the rectangular section and is provided with an adjustable crank head at the end next to the ram, being driven through back gears by an individual electrical motor. The arbor which carries the gear blanks is not made solid with the ram, but fits in a socket in a spindle which is journaled inside the ram and is free to rotate independently of the reciprocating motion imparted to it by the ram. An intermittent indexing movement is imparted to the spindle, after each cutting stroke, by an intermittent gear

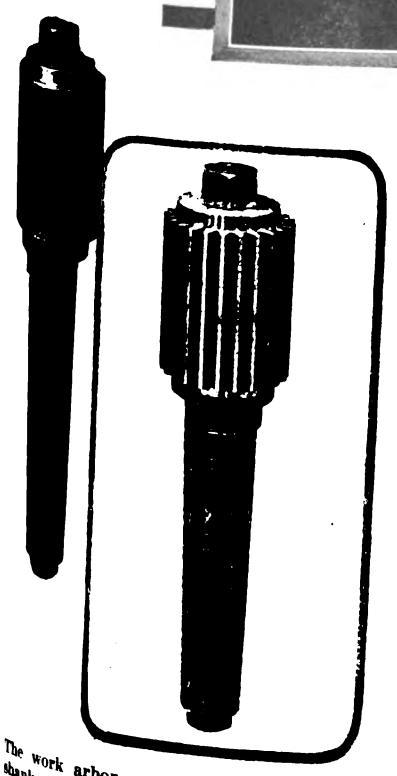
(*Continued on Page 59*)



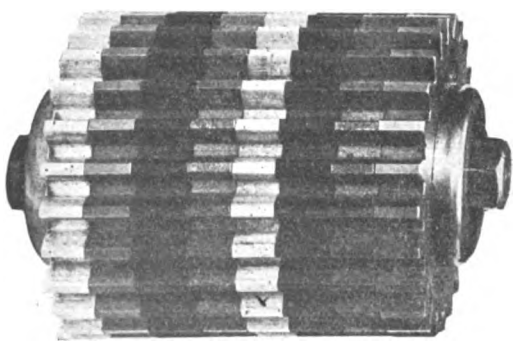
A machine which can cut, not one, but all the teeth of a gear at one time.



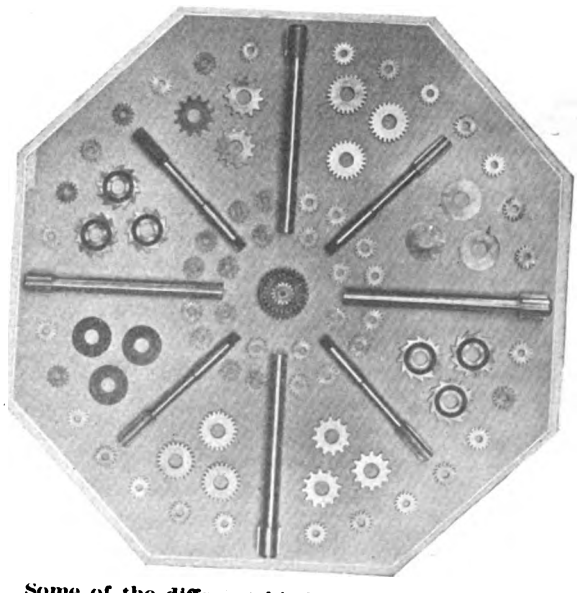
The tool head as it appears on the machine, is shown above at the left; while at the right is a view of the head partially disassembled, showing the details of cutting tools and feeder mechanism.



The work arbor, provided with a taper shank and thrust collar; the latter preventing taper shank from being thrust too tightly into the socket.



Steel, Cast Iron, Brass, Fibre, and Aluminum—all cut in a single operation.



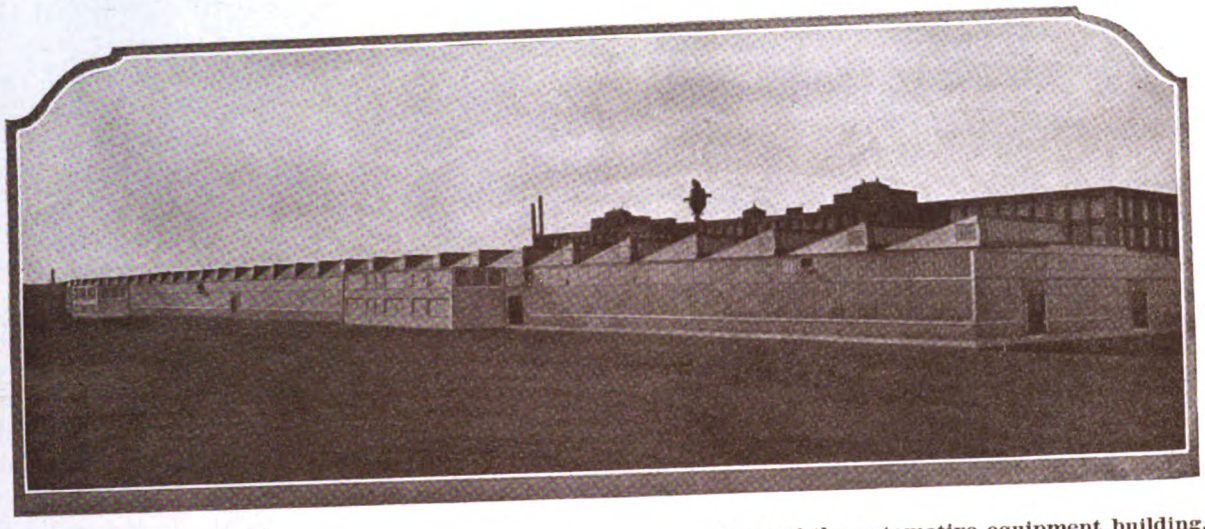
Some of the different kinds of products cut by means of this ingenious tool. Not only gears, but reamers and milling cutters lend themselves to this method of production.

Digitized by Google

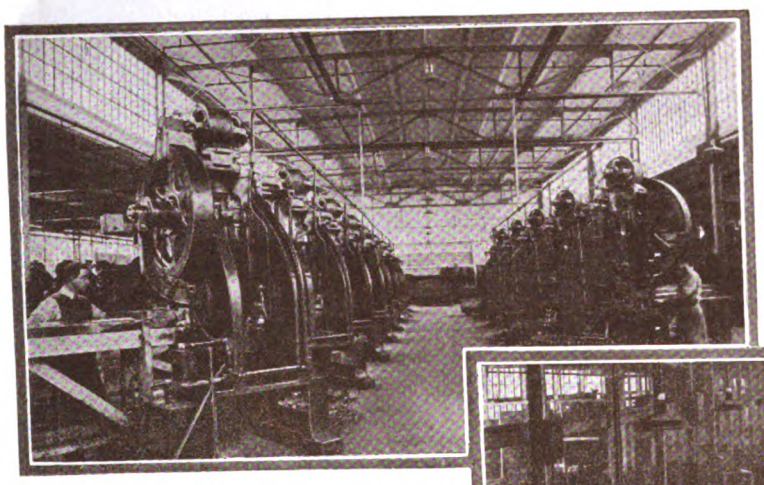
Graphics as a Production Stimulant

How It is Applied to Westinghouse Automotive and Radio Equipment

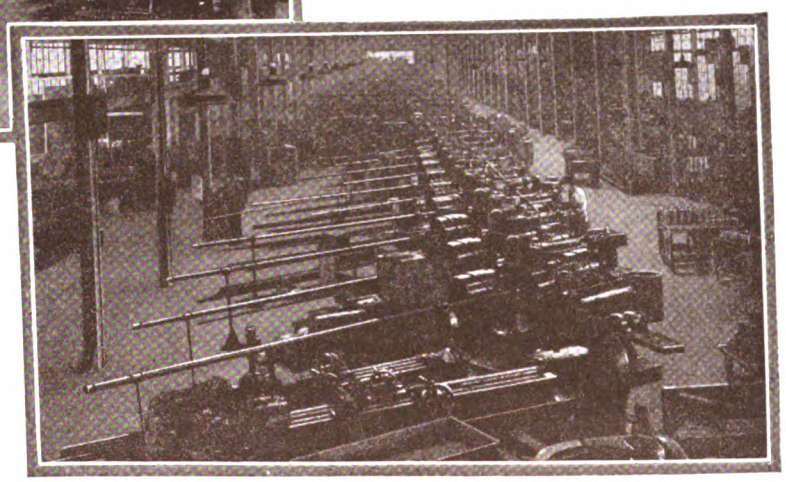
By John H. Van Deventer



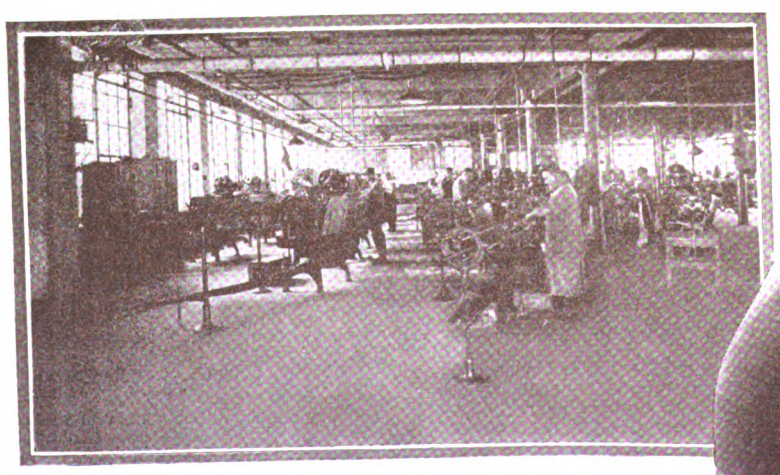
View of the automotive equipment building, a one-story construction in which the flow of material is all one way. Raw materials enter at one end and finished starting and and lighting units come out the other.



The press department, where millions of armature laminations are stamped for thousands of small armatures. The stock, thin strips of special steel, is fed automatically by "roller feed" devices attached to each press.



Battery of automotive screw machines in the "feeder" department. Note the individual motor drive and the angular placement of machines to economize space.



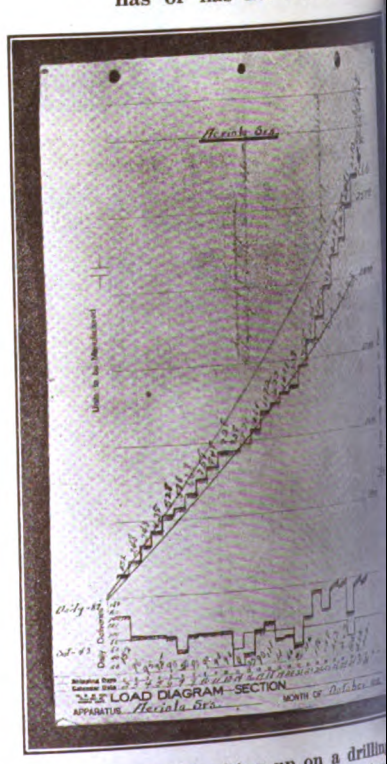
A group of four-spindle automatics ... shown here, also with individual m... drive, a great saving on belts sli... and power, the latter particular... overtime or part time operat...



PRODUCTION at the East Springfield Works of the Westinghouse Electric and Manufacturing Company presents unusual features of interest to industrial executives and engineers. The first feature is the departmentalization or the dividing up of the work to be done and its segregation. The second point of interest is the handling of an immense total production made up of an extremely great variety. The third and most interesting aspect perhaps is the graphic methods employed to check and stimulate scheduled output.

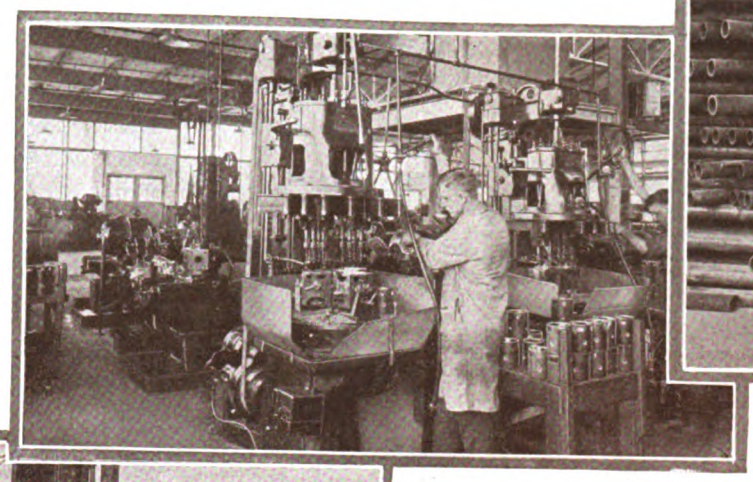
Departmentalization in a parent company, such as the Westinghouse, goes much further back than the matter of dividing work and of sending it through suitable departments in any one plant. It goes all the way back to the question of how big the plant itself should be to economically pro-

Below is a "load diagram" chart on which the quota for the month has been indicated by the unbroken inclined line. The cumulative steps recorded daily show how the quota has or has not been met.

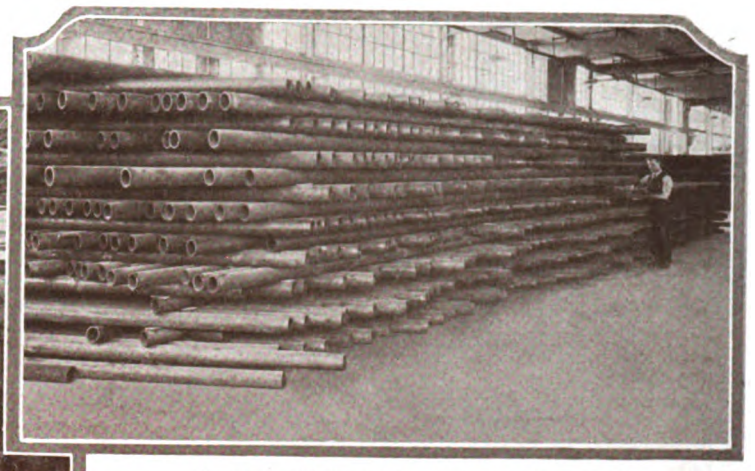


Center—Checking up on a drilling jig, in the tool room. Dimensions to the ten thousandth part of an inch are easily obtained by means of the standard blocks seen in the wooden case.

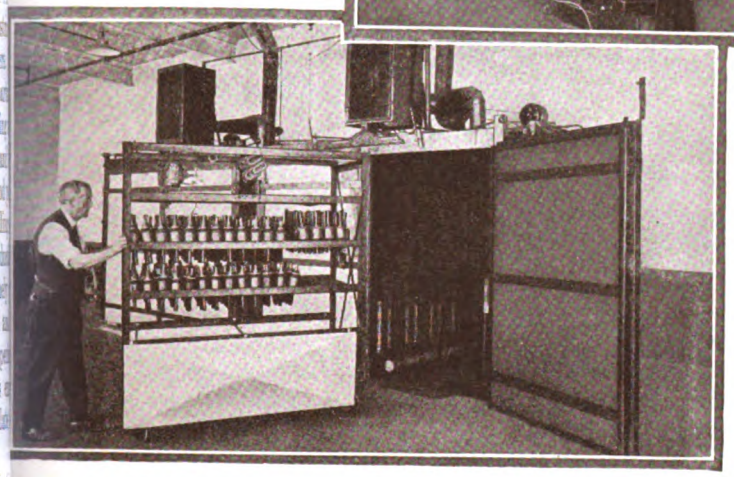
Digitized by Google



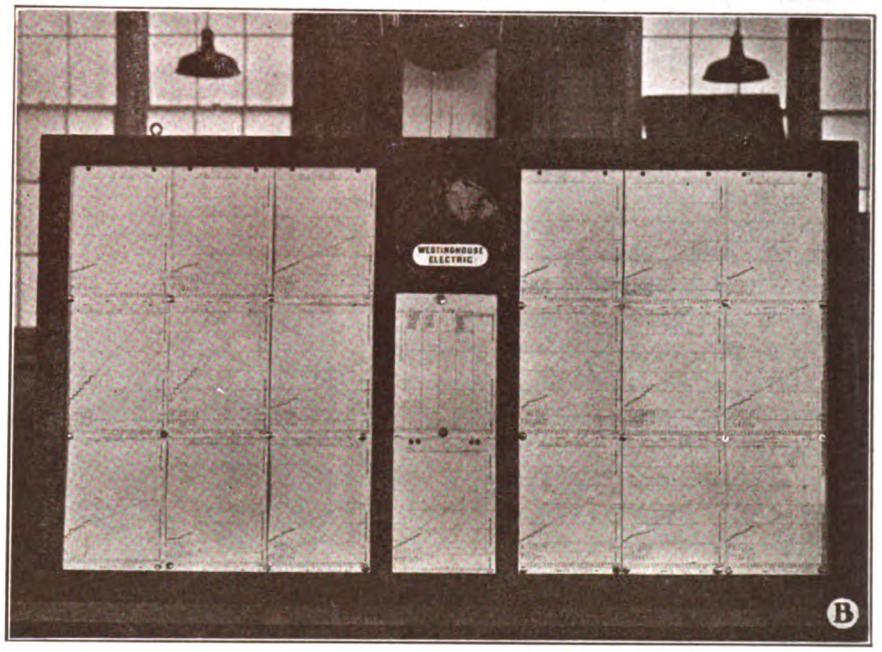
After the starter motor frames have been bored and turned on "Mult-Au-Matics," they are jig-drilled as shown here. Note the type of shop trucks employed to prevent stooping and lifting by operators.



Starter motor and generator frames in the "rough." Heavy steel pipe is used for this purpose, this being cut to suitable lengths and machined all over.



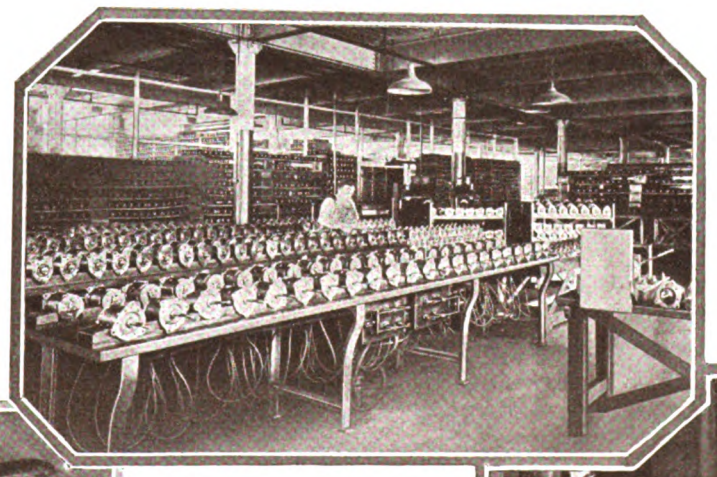
Armatures are "baked" in electric ovens to harden the insulation.



View in one of the manufacturing departments showing "load diagrams" posted on the bulletin board. This lets everybody know how the department is meeting its production requirements.

duce a certain product and to the equally important question of how big it *should not be* if it is to be kept from becoming unwieldy and inefficient. For a plant that is too big is often in as serious a condition as one that is too small. When any factory gets so big that its works manager and superintendent, for example, are out of touch with material, mechanical and human details, it is approaching the "saturation point" for profitable operation.

The East Springfield Works, where starting motors and generators, standard and special fractional horsepower motors and radio equipment



Inspection of starter motors, after electric test. Just as soon as a motor has been "O. K'd" it is boxed, the packing tables being across the aisle to the left. Thus there is no chance of the motor being damaged in storage before shipment.



Dynamometer test of a starting motor. The "characteristics" required by each type of apparatus must be rigidly met, and are verified on the test bench.



Westinghouse radio equipment is also made at the Springfield Works. This illustration shows the sorting and breaking of detector crystals, used in the less expensive sets.

Digitized by Google



Progressive assembly is adopted for radio work. The flow of work does not require mechanical transportation. Notice the shelf at the back of each bench. Finished operations are placed here and are easily reached by operatives on the succeeding stage of assembly.



Detailed production charts are posted for individual operations when production falls behind. The moral effect is surprisingly good.

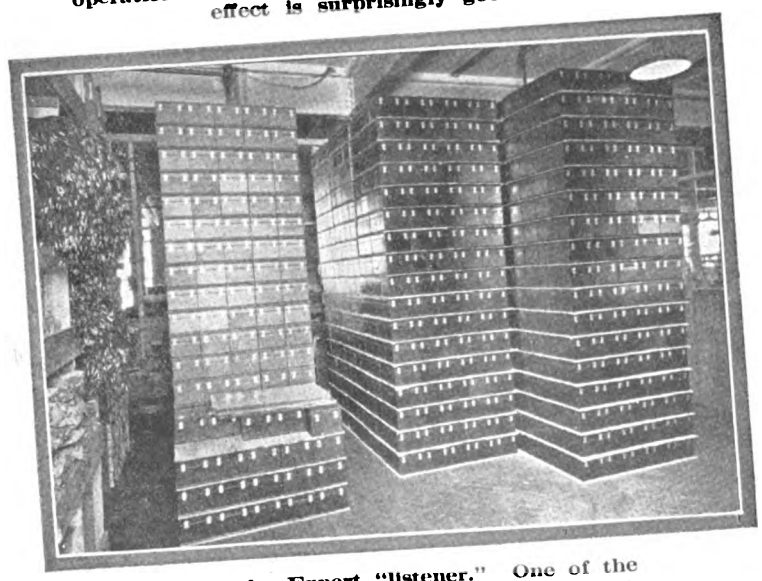


Further along in the Aerola, Sr. assembly department the sets are fastened in their hardwood cases, a supply of which is shown in centre illustration.

are made, while an integral part of the Westinghouse Company is a specialized plant separated physically from other Westinghouse plants and containing some hundred thousand feet of floor space. The plant itself has again been departmentalized to suit the needs of the chief types of product. These plant departments in addition to the foundry, stamping department, tool room and general machine shop, which are of course feeders to all departments, consist of the radio department, the standard motor department, the special motor department and the automotive equipment department. The illustrations accompanying this article show very clearly the physical arrangements of these departments as well as some of the methods employed in them.

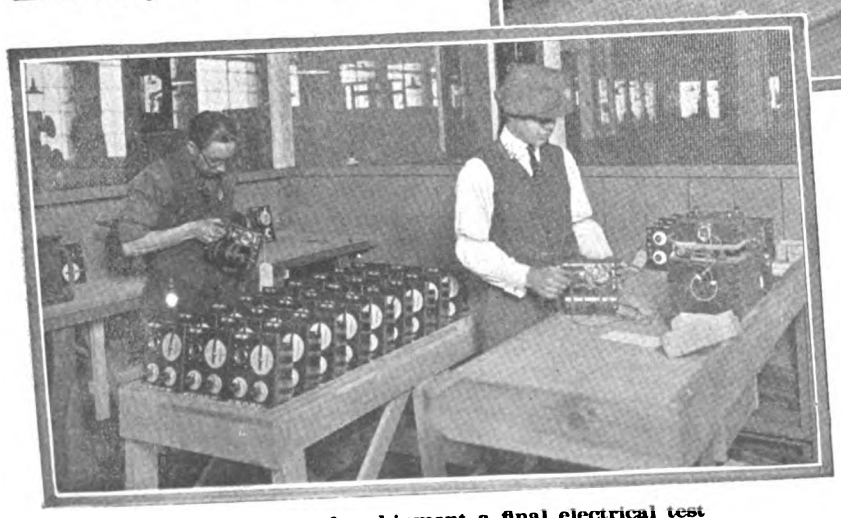
I have spoken of the feature of an immense total production consisting of a great variety of products. This is true of almost every one of the specialized departments with the exception of the radio. Even in automotive equipment there may be thirty or forty different types of starting motors or generators in production at one time. As for the special fractional horsepower motors, these vary from comparatively large one horsepower direct-current motors to tiny special purpose ones that can be almost carried in a vest pocket. The quantities in which these are run through depend entirely on the nature of the orders. Lots as small as six are frequent and in quite a number of cases are confined to individual machines. Yet the total production involved is of course large as may be imagined from the fact that three thousand men and women are employed at this one plant. This feature as will be realized at once by those conversant with manufacturing problems, makes the subject of production a difficult and hence interesting one.

(Continued on Page 64)

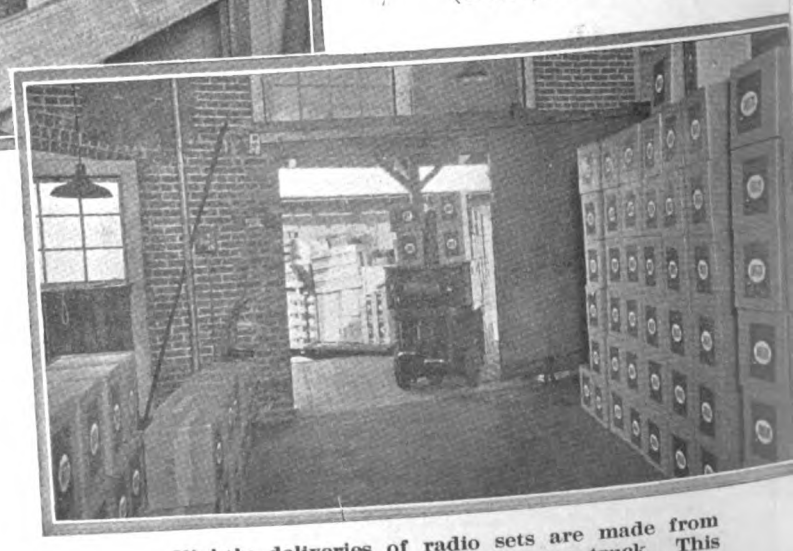


Below—An Expert "listener." One of the inspectors on the final receiving set test.





Before boxing for shipment a final electrical test is made to insure freedom from short circuits. Then the apparatus is carefully packed in cardboard containers.



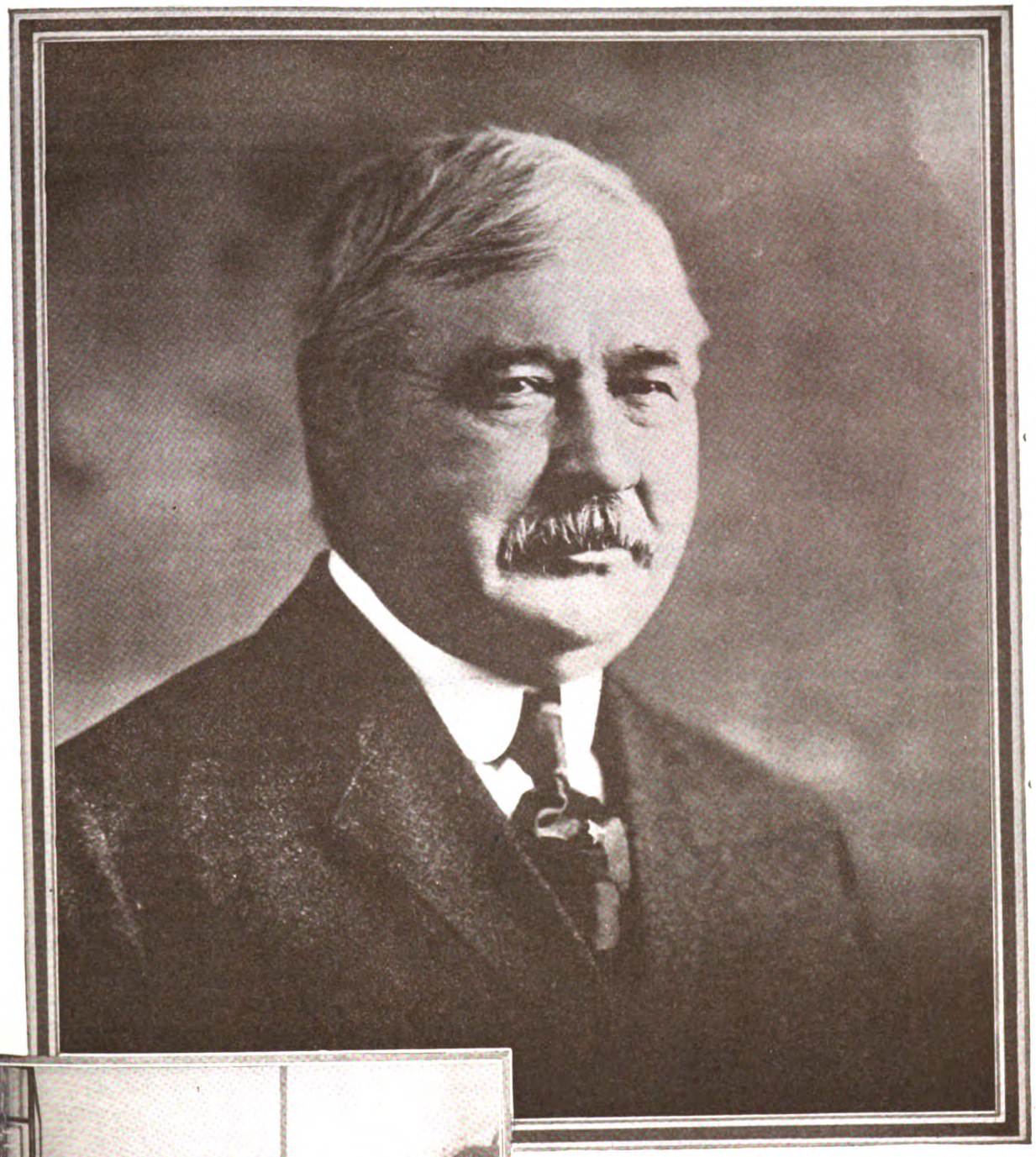
Nightly deliveries of radio sets are made from Springfield to New York by motor truck. This picture shows the shipping department and an electric truck used to load the automobile seen in the background.

Digitized by Google

Getting Out from Behind the Horse

The Career of Ellwood Haynes

By Ernest H. Rowe

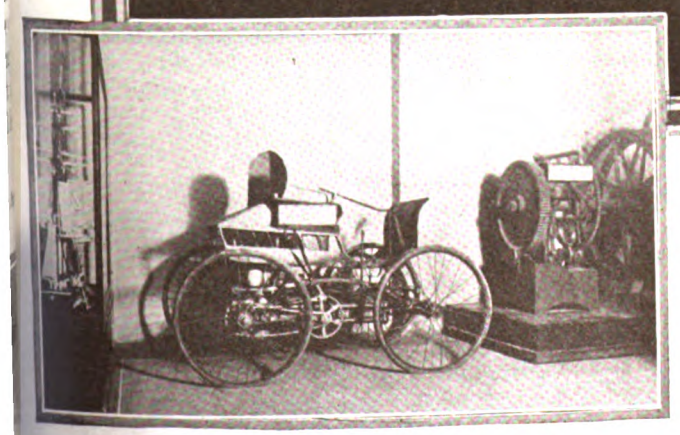


Ellwood Haynes, hale and hearty at sixty-five, is a splendid example of the strenuous, creative American. Beside his achievement in producing the first practical automobile, Mr. Haynes has many inventions to his credit, as outlined in the accompanying article.

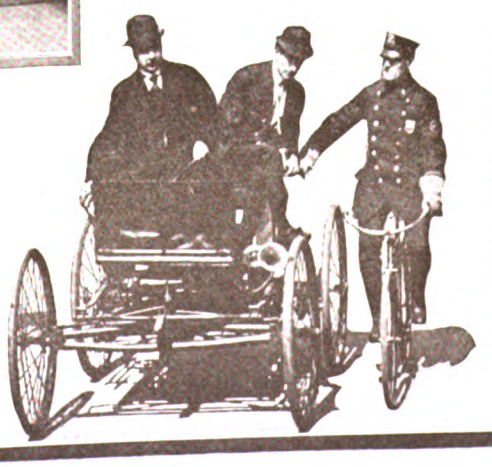
IF Dr. Russell H. Conwell ever delivered his famous lecture "Acres of Diamonds" to an audience in which Elwood Haynes sat, he talked to one listener who probably would be interested in what he was saying, but who did not need the lesson he put so graphically into that remarkable discourse. Elwood Haynes has found a lifetime of opportunity, activity, success and fame within sixty miles of his birthplace, and in the line of work which first attracted him as a boy of fourteen. No skipping about for him, no roaming far afield, either in person or in fancy. He has moved just once, from Portland, Indiana, which was his "old home town," to his new home town of Kokomo, also in the state of Indiana. If Portland had had a college, probably he wouldn't have gone away to college. As it was, he came straight back home, as soon as the Eastern institutions would let him go, with his graduate and post-graduate sheepskins and degrees, first to be principal of the home high school, and then to teach science in the normal school.

But he is the sort that would rather practice than preach, rather do than teach. When he was only fourteen he got hold of his older sister's textbook on chemistry, and

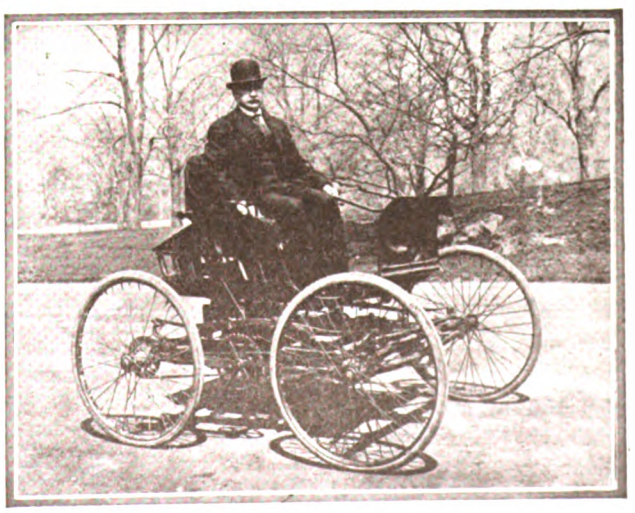
(*Continued on Page 66*)



The original "horseless carriage," at the Smithsonian Institute, Washington, D. C.



Driving to Chicago in his 1895 model, to enter the Times-Herald race, Mr. Haynes was ordered off Michigan Boulevard by a policeman—and there were no motorcycle police in those days.



The inventor and builder "at the tiller" of America's first automobile, which is now exhibit number 262,135 at the Smithsonian Institute.

Digitized by Google

Handling Coal and Ashes on the Pivoted Bucket Carrier

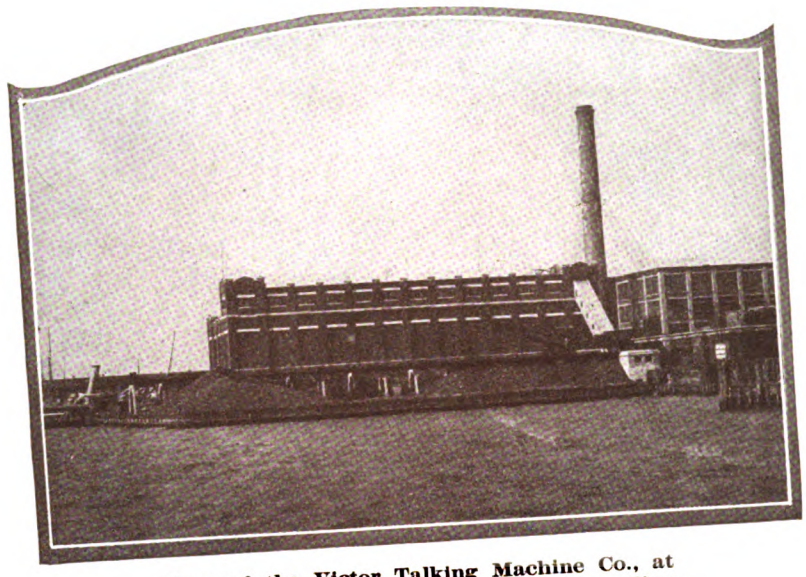
By C. H. McL. Burns

OUR very industrial supremacy seems to be ample proof that the immediate reduction in costs is not the only benefit to be secured from mechanical equipment, but that the less of a drudge a man is, the more intelligent, efficient and contented he becomes.

Nowhere is this truer, and the indirect saving more noticeable, than in the boiler room of a power plant. In the antiquated boiler room, with hand stoking, cleaning fires, quenching hot ashes in a cloud of steam and dust, and wheeling them out, a fireman can be nothing but a drudge. In the first place it is practically impossible to get a good fireman to work under these conditions, and in the second place he has not the time to give his fire the proper attention. On the other hand, a modern and well equipped boiler house, attracting as it does the best class of men, leaves a fireman free to concentrate his efforts on the feed of the stokers, the draft, and the proper condition of his fires for efficient steaming.

With modern mechanical equipment for handling coal and ashes it is quite possible to increase the boiler efficiency ten per cent or more; which means a saving of about fifteen per cent in the amount of fuel used. This in itself is a very considerable item, without taking into account the expense saved in the actual handling of coal and ashes.

Coal is still our greatest source of energy in the industrial world, and the problem of its economical handling or transporation, ever increasing with its importance and consumption, is just as big today as it was to Stevenson and his fellows at the dawn of the last century. However, it is receiving a great deal of attention at the present time; the high cost of labor and the general trend toward efficiency and economy in industry, demand the mechanical handling of all materials. Without mechanical means of transportation—conveying and elevating—all of our important industries would be impossible under present economic conditions, yet it is not more than twenty-five or thirty years since the manufacture of conveying and elevating machinery as we



Plant of the Victor Talking Machine Co., at Camden, N. J., showing the coal handling installation.

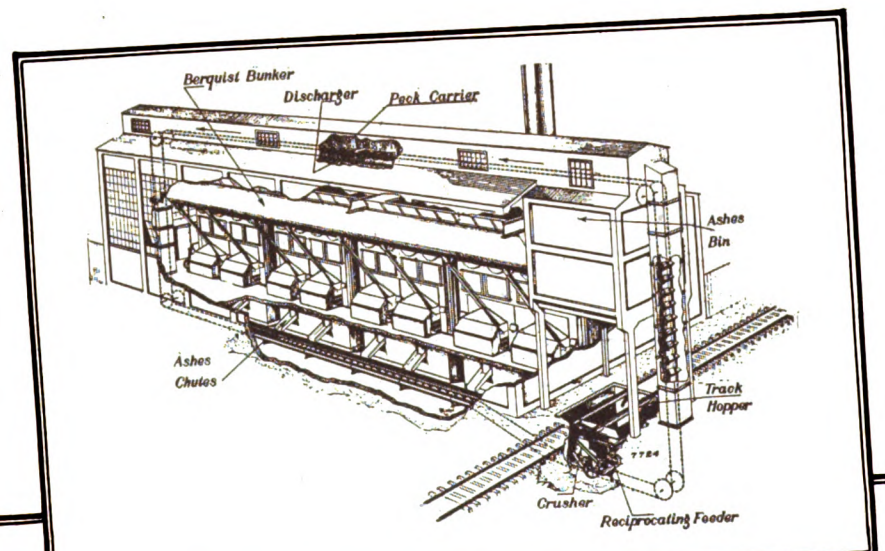


Fig. 2—Sketch showing a typical installation: the coal being carried from crusher below the track hopper, distributed over the length of the overhead bin, and spouted by gravity to automatic stokers.

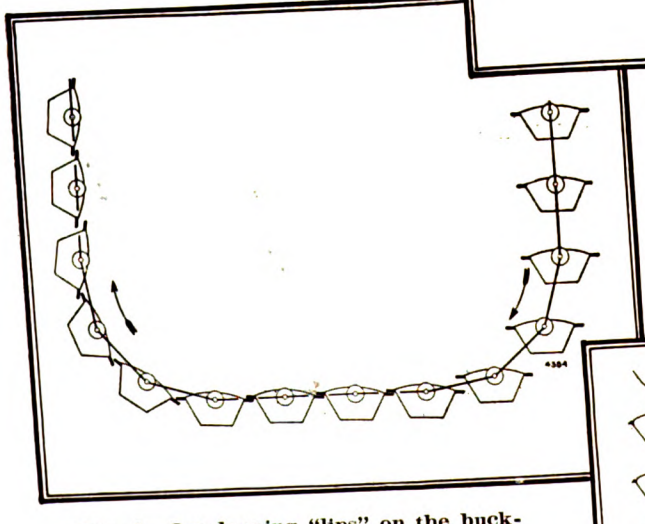


Fig. 3—Overlapping "lips" on the buckets prevent coal from dropping between; but, as shown above, the overlap introduces a complication: in ascending, the buckets would spill their contents.

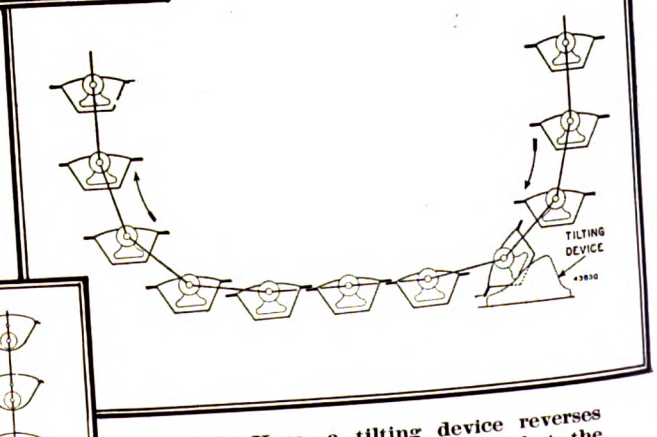


Fig. 4—Here, a tilting device reverses the overlap of the edges, so that the ascending buckets are not held down by the edge on ascending.

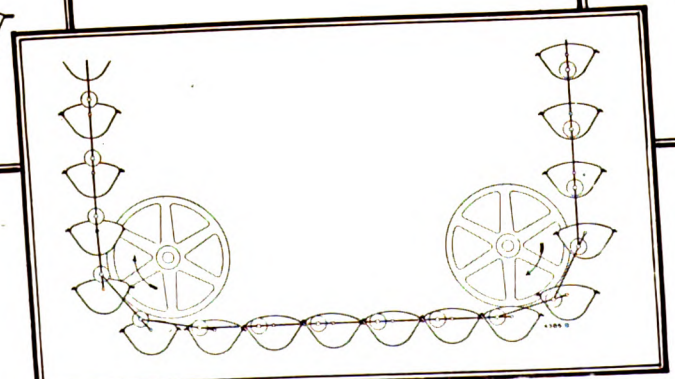


Fig. 5—By suspending the buckets from extension links, they travel a wider circle than the chain, thus overcoming in another way the difficulty shown in Fig. 3.

Digitized by Google

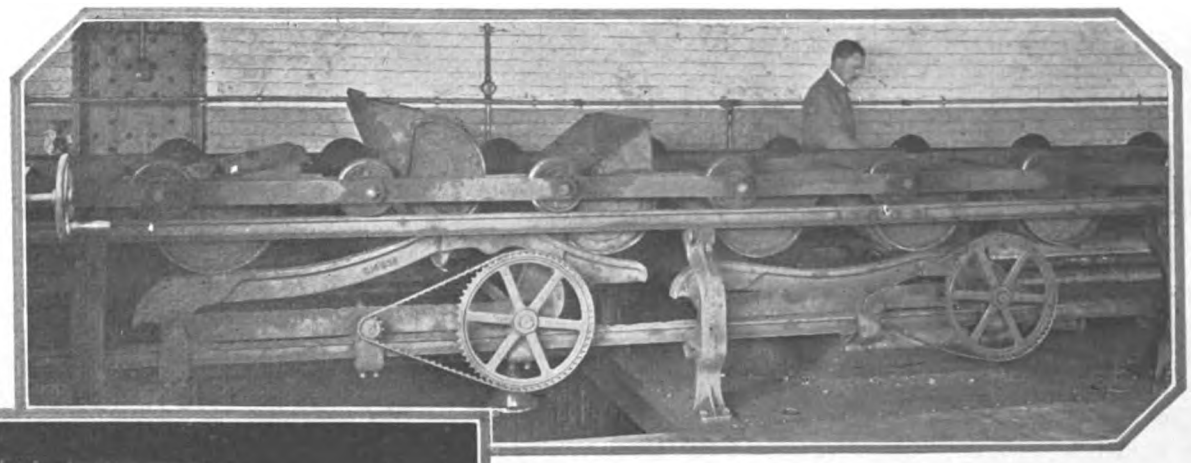
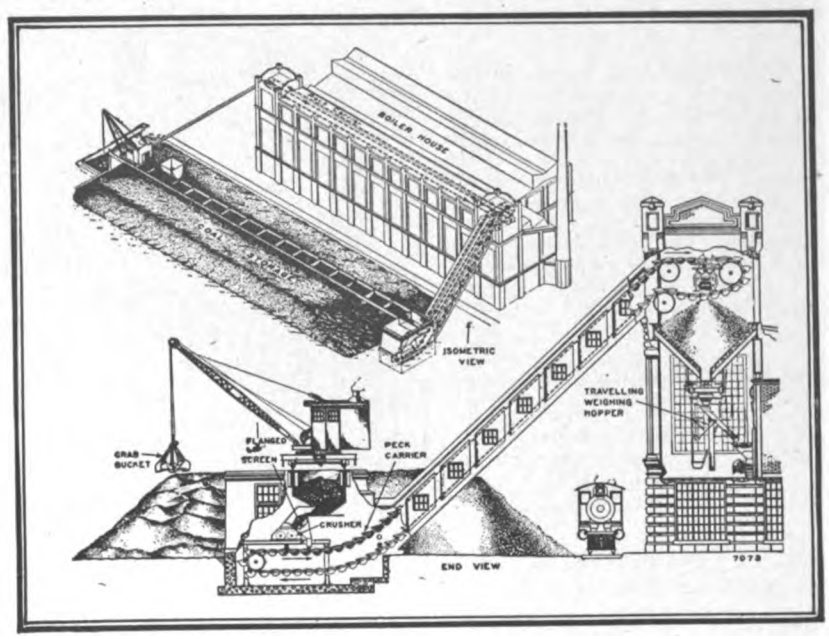


Fig. 6—A simple device which tips the buckets just enough to discharge their load, which can be either fixed or movable to any position on the horizontal run.



Fig. 8—View on the bucket run above the boiler house overhead bins.



know it today became general. Some of the leading manufactures of such equipment in this country at the present time were pioneers in the business nearly half a century ago, and the result of these years of experience, research and experimental work, has developed, especially in boiler house equipment, a product unsurpassed in the design of its mechanical details, and in efficiency.

In designing a storage and handling system for coal and ashes, in connection with a power plant, many factors have to be considered, and, unless the engineer has had considerable experience in this kind of work, many very important points are apt to be overlooked, and the result will

(Continued on Page 28)

Fig. 7—Above—Typical arrangement of a boiler house equipped with bucket carrier and overhead bin. This gives an idea of the details of the installation pictured at the head of this article.

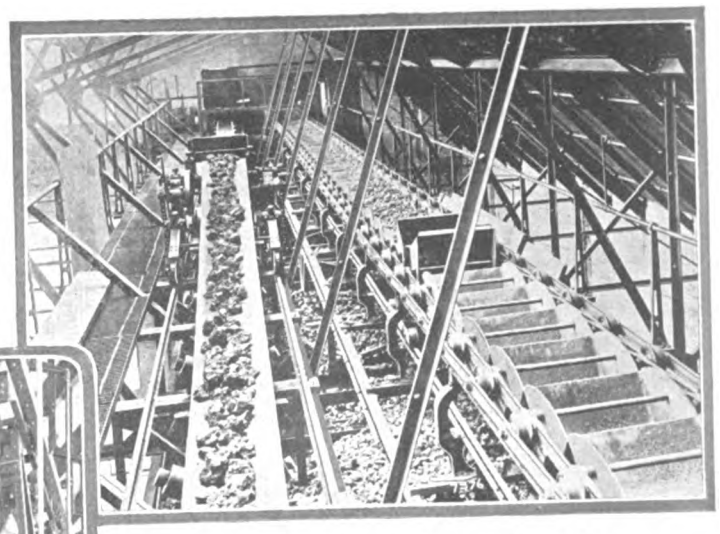


Fig. 9—Note the buckets at the right center (illustration above) in the act of dumping their contents to storage.

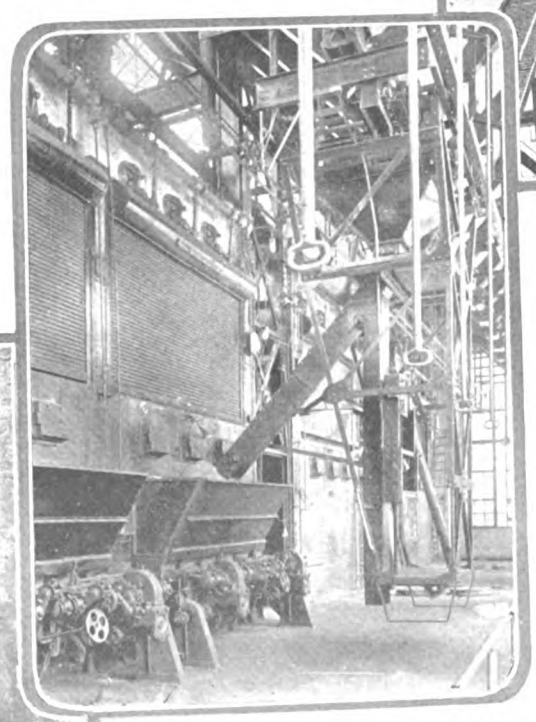


Fig. 10—At the left—spouts which deliver by gravity from overhead bins to automatic stokers.

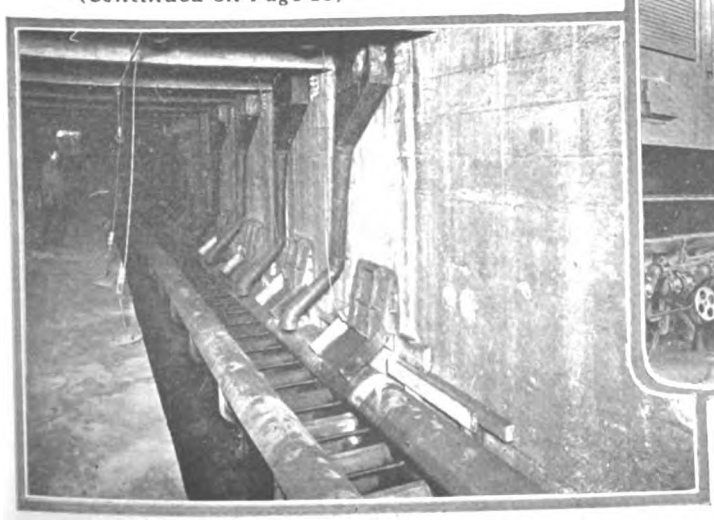


Fig. 11—At the left—ash chutes deliver ashes direct to bucket carrier for transport to final removal point.

Digitized by Google

Five Essentials of a Suggestion System

By George Gray

A SERVICE organization which had been installing some welfare features in a factory in the South received this letter from one of the employees:

"Could you get it across in our plant that a suggestion box system be installed? Not one that buries suggestions in a box but one which must consider every suggestion made. The production club would be a good jury. At the same time it would be kept lively. As a small plant in a small town, jealousies and personal considerations run riot here. Please don't mention my name."

There are two important items of information in this letter. One is the evidence of employee interest. The other is the evidence of employee suspicion and distrust. This man wanted an opportunity to submit suggestions, but he had had experience in another factory with the wrong kind of suggestion system. Hence his warning against a scheme that "buries suggestions in a box" and his concern for the securing of "a good jury." Many a suggestion system that was started on the crest of a wave of goodwill has gone down in a fog of indifference and suspicion, and the rock that

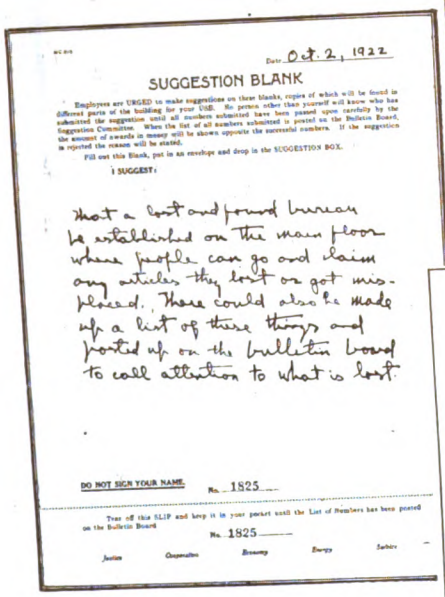
(*Continued on Page 36*)



Members of the Suggestion Committee, National Cash Register Co., who select the prize winners and decide questions of policy.



These employees devote their whole time to the suggestion system, handling the clerical work, at the National Cash Register Co.



Date Oct. 2, 1922

SUGGESTION BLANK

Employees are URGED to make suggestions on these blanks, copies of which will be found in different parts of the building for your USE. No person other than yourself will know who has submitted the suggestion until all numbers submitted have been passed upon carefully by the Suggestion Committee. When the list of all numbers submitted is posted on the Bulletin Board, the amount of awards in money will be shown opposite the successful numbers. If the suggestion is rejected the reason will be stated.

Fill out this Blank, put in an envelope and drop in the SUGGESTION BOX.

I SUGGEST:

that a lost and found bureau be established on the main floor where people can go and claim any articles they lost or got misplaced. There could also be made up a list of these things and posted up on the bulletin board to call attention to what is lost.

DO NOT SIGN YOUR NAME. No. 1825

Tear off this SLIP and keep it in your pocket until the List of Numbers has been posted on the Bulletin Board.

No. 1825

Note, above, the method of keeping the suggester's identity secret until decision is made.

On Guard!

Do you work on a machine?
Is the machine properly guarded?

In making a Safety Suggestion, the important question is:

"Can an accident occur?"
NOT:
"Has an accident occurred?"

One man's effort toward Safety may be small; 13,000 of us, working together, can accomplish much.

One think BEFORE an Accident is Worth a Million Thinks Afterwards!

Eastman Kodak Company

At the right—a tie-up between the Safety idea and the Suggestion System.



This bronze medal has been awarded in addition to cash awards, for meritorious suggestions.



The American Rolling Mill Company

AS A TOKEN OF APPRECIATION PRESENTS TO

Mr. William Hoover

of the Annealing Department

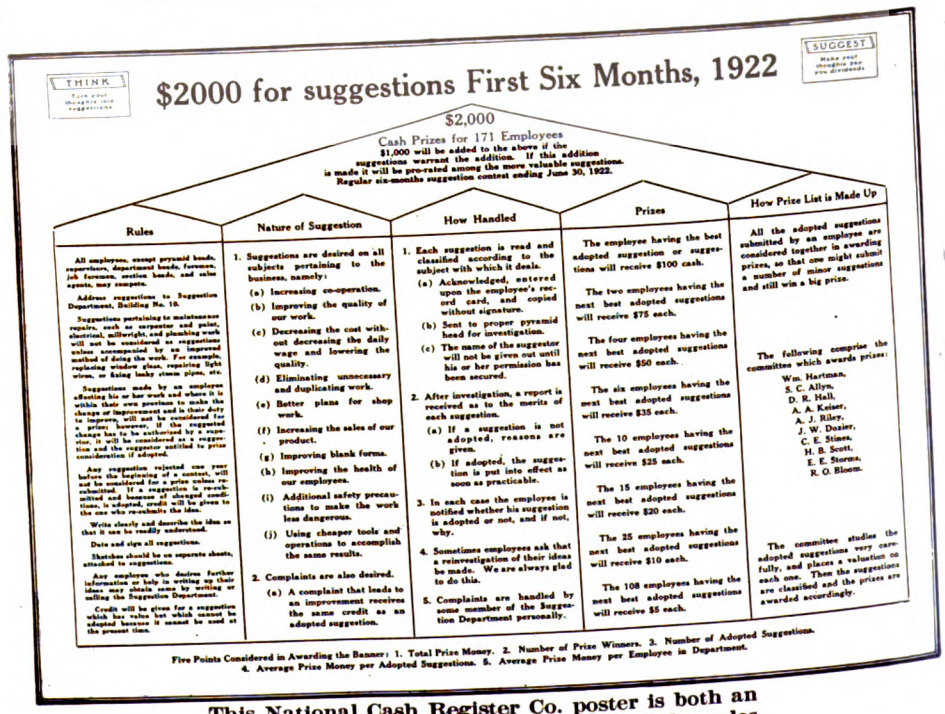
- A MEDAL OF BRONZE -

on which is engraved his name and the serial number 2-77

FOR THE SAFETY SUGGESTION

Close Clearance Signs
"No Room for Man On Side Of Car"

This certificate and a medal go to successful suggesters at one large plant.



THINK

Turn your thoughts into suggestions

SUGGEST

Make your thoughts pay dividends

$2000 for suggestions First Six Months, 1922

$2,000
Cash Prizes for 171 Employees
$1,000 will be added to the above if the suggestions warrant the addition. If this addition is made it will be pro-rated among the more valuable suggestions.
Regular six-months suggestion contest ending June 30, 1922.

Rules	Nature of Suggestion	How Handled	Prizes	How Prize List is Made Up
All employees, except pyramid heads, superintendents, department heads, foremen, sub foremen, section heads, and sales agents, may compete. Address suggestions to Suggestion Department, Building No. 16. Suggestions pertaining to maintenance repairs, such as carpenter and paint, electrical, millwright, and plumbing work will not be considered as suggestions unless accompanied by an improved method of doing the work. For example, replacing window glass, repairing light wires, or fixing leaky steam pipes, etc. Suggestions made by an employee affecting his or her work and where it is within their own province to make the change or improvement and is their duty to improve, will not be considered for a prize; however, if the suggested change has to be authorized by a superior, it will be considered as a suggestion and the suggester entitled to prize consideration if adopted. Any suggestion rejected one year before the beginning of a contest, will not be considered for a prize unless resubmitted. If a suggestion is resubmitted and because of changed conditions, is adopted, credit will be given to the one who resubmits the idea. Write clearly and describe the idea so that it can be readily understood. Date and sign all suggestions. Sketches should be on separate sheets, attached to suggestions. Any employee who desires further information or help in writing up their ideas may obtain same by writing or calling the Suggestion Department. Credit will be given for a suggestion which has value but which cannot be adopted because it cannot be used at the present time.	1. Suggestions are desired on all subjects pertaining to the business, namely: (a) Increasing co-operation. (b) Improving the quality of our work. (c) Decreasing the cost without decreasing the daily wage and lowering the quality. (d) Eliminating unnecessary and duplicating work. (e) Better plans for shop work. (f) Increasing the sales of our product. (g) Improving blank forms. (h) Improving the health of our employees. (i) Additional safety precautions to make the work less dangerous. (j) Using cheaper tools and operations to accomplish the same results. 2. Complaints are also desired. (a) A complaint that leads to an improvement receives the same credit as an adopted suggestion.	1. Each suggestion is read and classified according to the subject with which it deals. (a) Acknowledged, entered upon the employee's record card, and copied without signature. (b) Sent to proper pyramid head for investigation. (c) The name of the suggestor will not be given out until his or her permission has been secured. 2. After investigation, a report is received as to the merits of each suggestion. (a) If a suggestion is not adopted, reasons are given. (b) If adopted, the suggestion is put into effect as soon as practicable. 3. In each case the employee is notified whether his suggestion is adopted or not, and if not, why. 4. Sometimes employees ask that a reinvestigation of their ideas be made. We are always glad to do this. 5. Complaints are handled by some member of the Suggestion Department personally.	The employee having the best adopted suggestion or suggestions will receive $100 cash. The two employees having the next best adopted suggestions will receive $75 each. The four employees having the next best adopted suggestions will receive $50 each. The six employees having the next best adopted suggestions will receive $35 each. The 10 employees having the next best adopted suggestions will receive $25 each. The 15 employees having the next best adopted suggestions will receive $20 each. The 25 employees having the next best adopted suggestions will receive $10 each. The 108 employees having the next best adopted suggestions will receive $5 each.	All the adopted suggestions submitted by an employee are considered together in awarding prizes, so that one might submit a number of minor suggestions and still win a big prize. The following comprise the committee which awards prizes: Wm. Hartman, S. C. Allyn, D. R. Hall, A. A. Kaiser, A. J. Riley, J. W. Dozier, C. E. Stines, H. B. Scott, E. E. Storms, R. O. Bloom. The committee studies the adopted suggestions very carefully, and places a valuation on each one. Then the suggestions are classified and the prizes are awarded accordingly.

Five Points Considered in Awarding the Banner: 1. Total Prize Money. 2. Number of Prize Winners. 3. Number of Adopted Suggestions. 4. Average Prize Money per Adopted Suggestions. 5. Average Prize Money per Employee in Department.

This National Cash Register Co. poster is both an announcement and a general outline of the rules governing its Suggestion System.

Digitized by Google

Weighing Materials "On the Move"

Some of the Things Made Possible by Conveyor Weighing

AS industry has more and more, become converted to scientific methods, the matter of accuracy in weights—of raw materials, coal, and so on—has assumed a growing importance. But, coincident with the need for accurate weighing, has grown the demand for speed in moving these materials to and through the plant; and speed and accuracy are two factors so opposite in characteristics that they are difficult to reconcile.

With the development of conveyors—belt, bucket, or pan—the question of speedy and laborless transport of bulk materials was solved. But, until a few years ago, no matter how fast these materials could be transported, if an accurate check on their weight was required there had to be a pause in the steady flow somewhere along the line to permit of weighing.

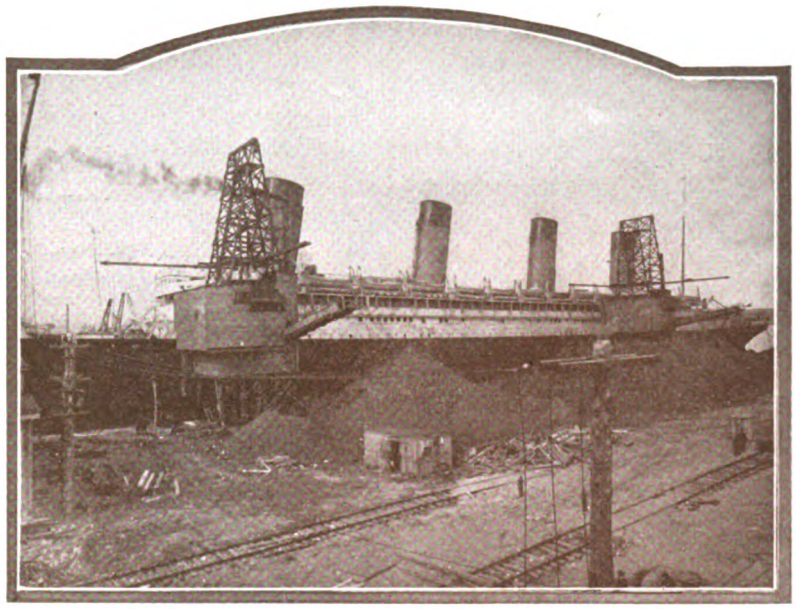
It is a comparatively simple matter, to measure the volume of a gas or liquid passing through a pipe. But measuring the *weight* of bulk material in motion on a conveyor, involves entirely different principles; yet by an ingenious system of suspension and gearing, even this has been accomplished. A portion of the conveyor is suspended on a floating platform hung from a load lever system similar to a platform scale. The load on this suspended portion is counterbalanced by a steel float in a mercury bath supended from the long end of the weighing beam. This float allows the beam to move from its zero position (the position when no material is on the conveyor) in exact proportion to the weight of material on the suspended portion of the conveyor at any given moment. At the same time, by gearing from the conveyor itself, a mechanical integrator transmits this beam motion to the actual weight indicator, in proportion to the speed of travel: so that, with the conveyor at rest, though loaded, the indicator registers no weight passing; if the conveyor is operating at full speed, but empty, the indicator still remains at zero; while for all conditions of speed and load the two integral factors produce an accurate indicator reading.

Not only in loading in and out, but in many manufacturing operations this method of weighing eliminates a man at the scale and results in better organization of production processes.

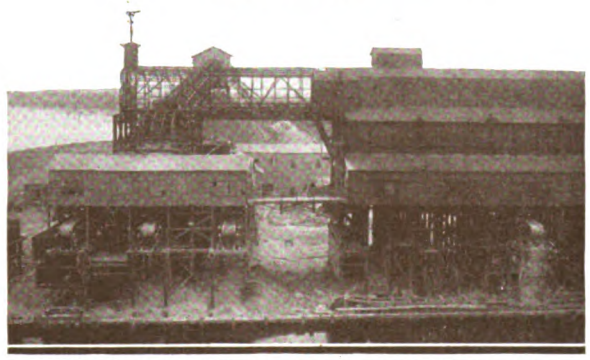
For example, at the coaling station of the British Ministry of Shipping, Halifax, N. S. the coal is drawn from the storage pile by grab buckets, which discharge upon a belt conveyor, is passed to the hold of the vessel; being weighed on this conveyor. Thus an automatic, accurate check is kept on the amount of coal loaded.

At the plant of the Milwaukee Coke & Gas Co., Milwaukee, Wis., as at many other plants, the coal is discharged from the cars to a belt convey-

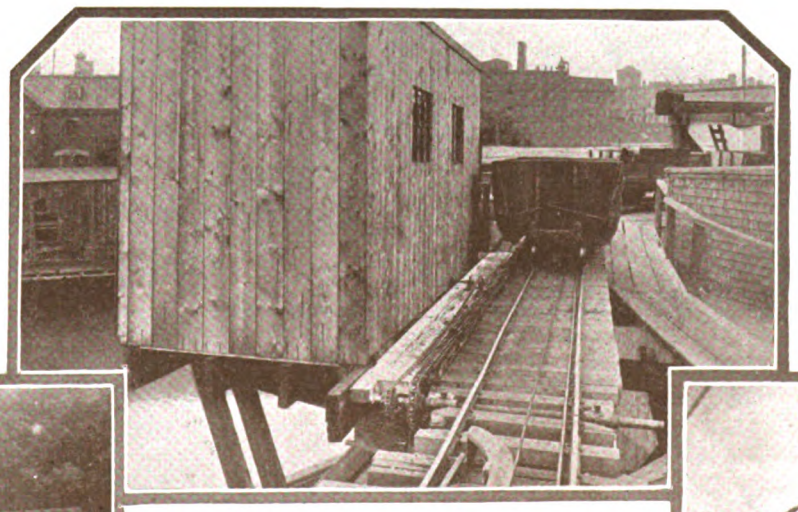
(*Continued on Page 50*)



Coaling station of the British Ministry of Shipping, Halifax, Nova Scotia, Canada. The coal is drawn from the coal pile by means of grab buckets, deposited on the conveyors which run through the scale house, and discharged to the ships' bunkers.



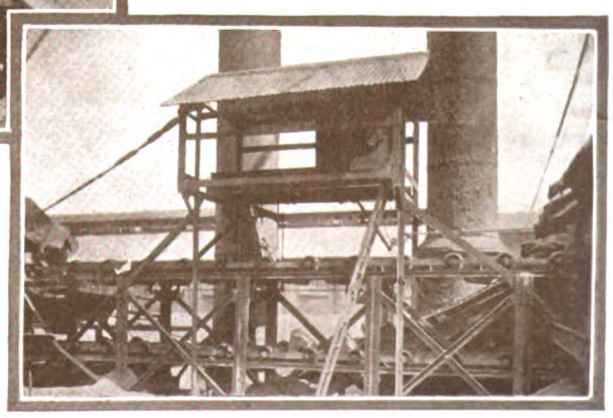
Plant of Michigan Limestone & Chemical Co., Rogers, Mich.—Five to six millions of tons of stone yearly are weighed and billed over conveyors. Views show loading conveyors discharging to barges



Cable car approaching track scale. Here the weight is automatically recorded while the car is in motion.



Typical Coal Mine tipple. The conveyor scale is placed in this pent house shown on the long conveyor and weighs the coal as it comes from the mine crushers.



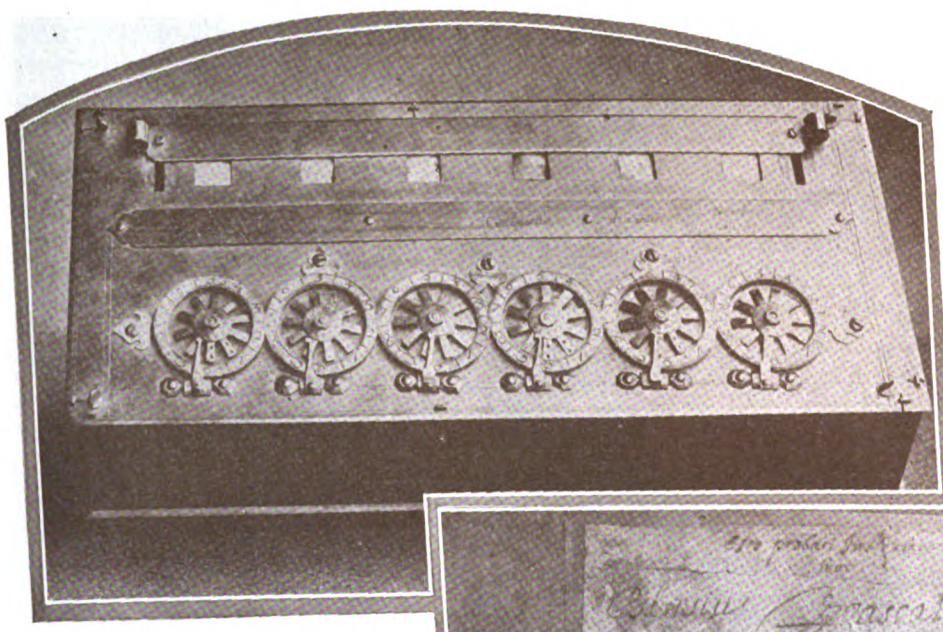
Typical installation of a conveyor scale installed on a bucket conveyor handling hot cement clinker. The weight of the material is mechanically recorded.

Digitized by Google

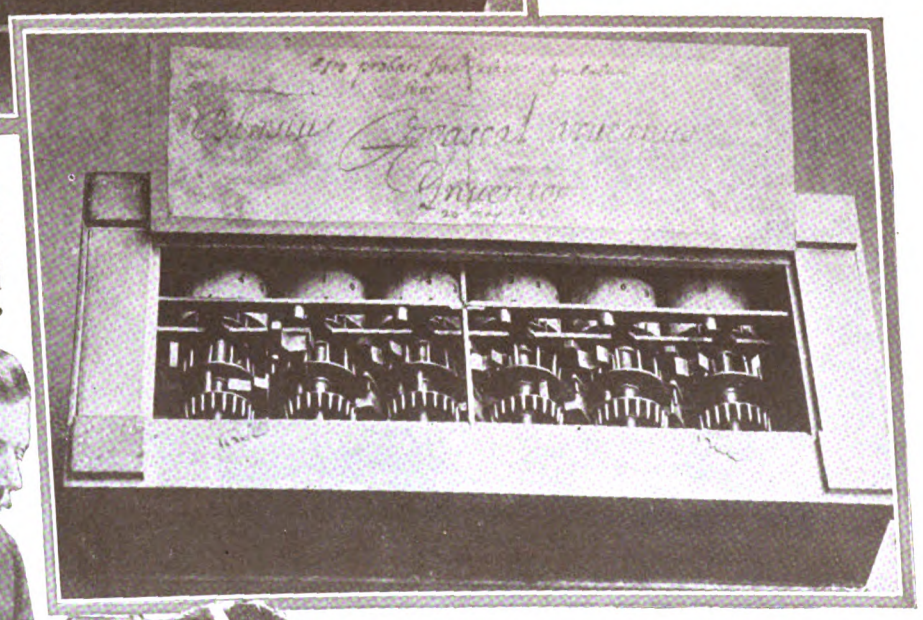
Getting Figures that Can Not Lie

The Evolution of the Adding Machine

BY ERNEST H. ROWE



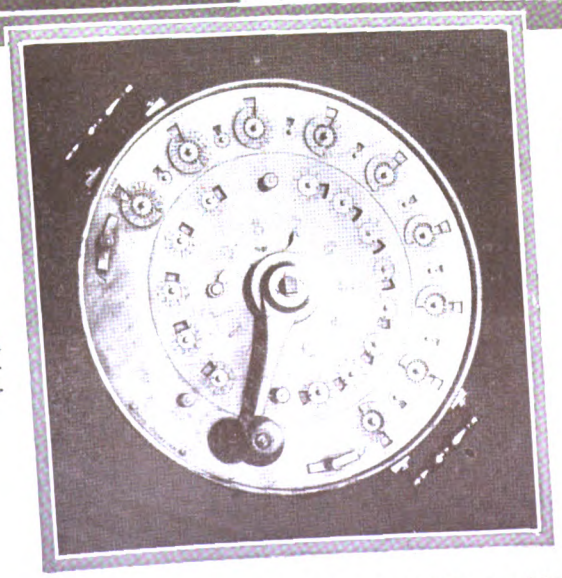
Pascal's, the first automatic calculating machine known, fortunately preserved in the Paris Museum of Arts and Trades. Designed to figure English money Its principles are extant in modern machines. Top front view.



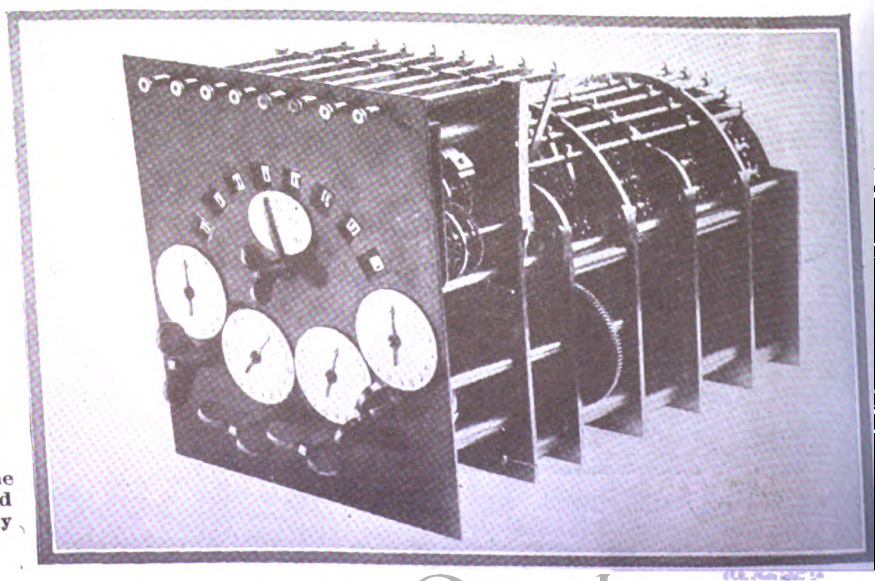
Bottom view of Pascal's machine. Inscription: "Esto probate instrumenti symbolum hoc Blasius Pascal arvernus Inventor. 20 May, 1652." Translation: "May this signature be the mark of an instrument approved and invented by Blaise Pascal. May 20, 1652."



The first all-around successful calculating machine. Thomas' Arithmometre, invented about 1820. Improved, it is in use today.



Roth's calculator, about 1841. A Pascal type machine, but unsuccessful from the practical standpoint.

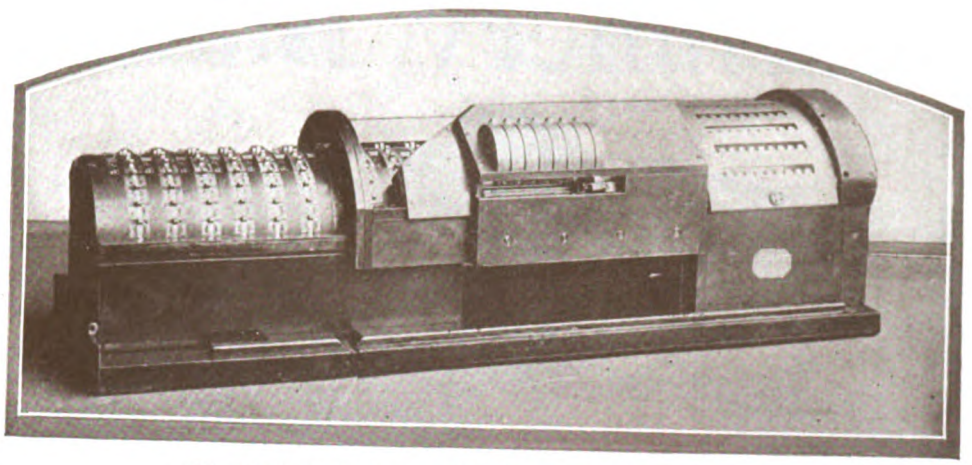


Maurel and Jayet's (1847) machine in the Paris Museum of Arts and Trades. Another attempt to apply the Pascal method.

IN tracing the history and development of any of our modern labor-saving devices, from the highly complicated typesetting machine to the comparatively simple revolution counter, it is interesting and significant that one fact is common to almost all of them: no matter how ancient or how recent the first attempts may be, the greatest strides in perfecting these new machines were made after man had harnessed steam to do his bidding. That, of course, brought into being the epoch of factory production, assembling many workers under one roof. This emphasized the time element in production, exposed the aggregate time losses made up of small units of loss that were invisible or negligible under the cottage system of production, and made it worth while and feasible to apply methods and devise machines to save them.

Naturally enough, such appliances were made and used for shop practice long before any were devised for office use. It was hardly thought that the mental operations of accounting and recording could be made mechanical. While the first actual adding machine was designed for figuring English money, it was more than two hundred years before another machine for the practical pur-

Digitized by Google



The Russian mathematician, Tchebycher (1871), endeavored to combine the principles of the Pascal and Thomas machines.

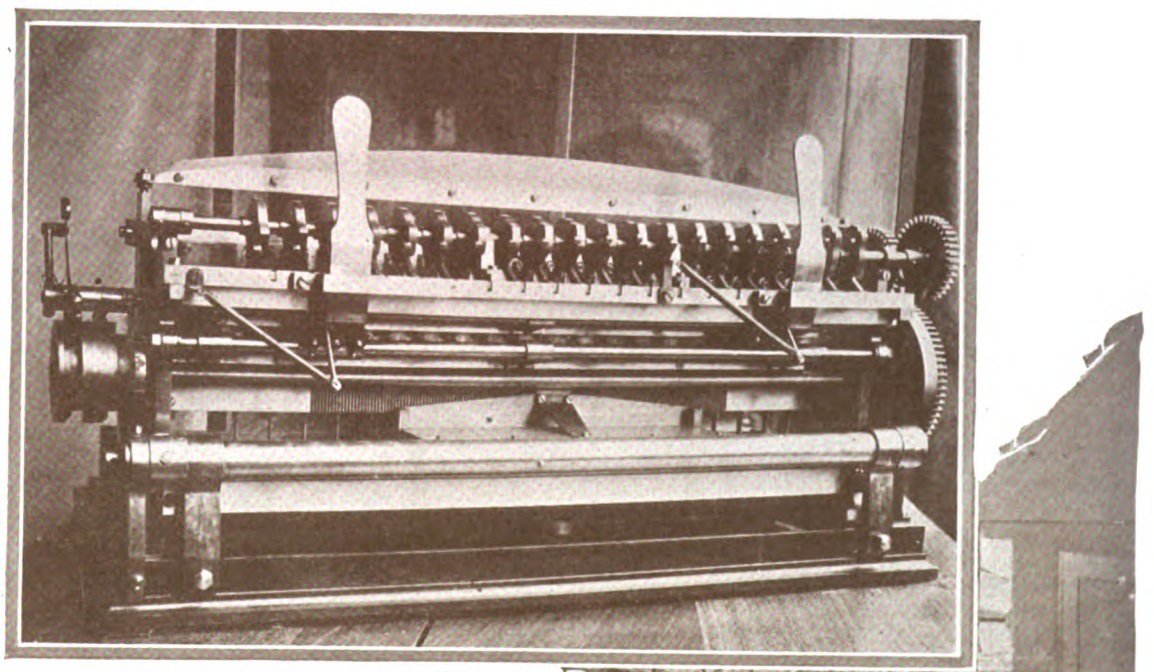
He carried the art forward a step, but without arriving at the goal of practical success.

poses of accounting was produced. This first machine was invented by the French Savant, Blaise Pascal, in 1652, when he was but nineteen years of age. It is now in the Paris Museum of Arts and Trades and is shown in the first two illustrations of this article. It will be apparent that the discs must be turned by hand. Many machines are mere refinements of the Pascal model without improving on that feature, although many inventors endeavored to eliminate it, but without success for a long time.

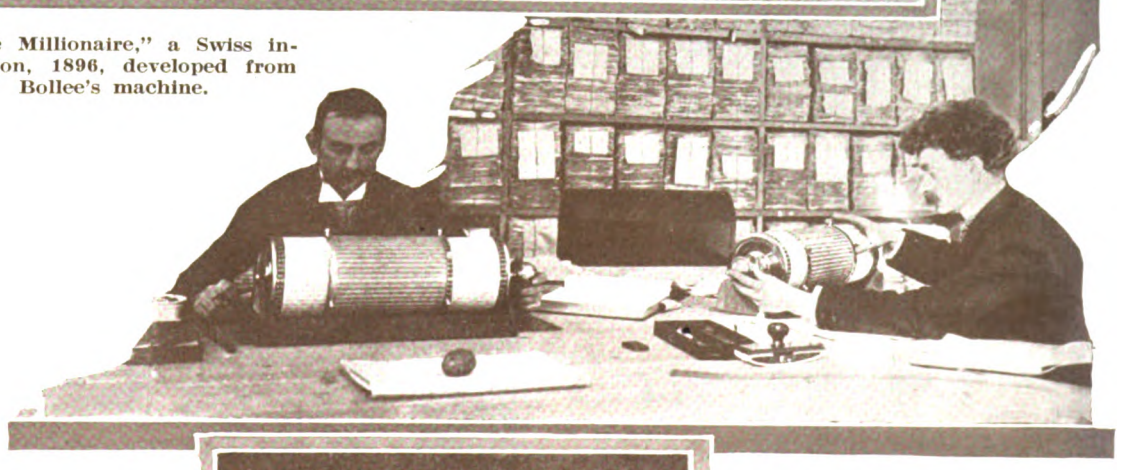
European development pursued the idea of a machine that would perform a variety of mathematical calculations, for the use of scientists; while in America, the land of big business, the inventors, when they began to work about the middle of the nineteenth century, undertook to produce an adding machine to speed up and improve the bugbear of bookkeeping. The great Russian mathematician Beidnitz created a marvel in 1694, which is still in existence, but which imperfectly performed its intended task of assisting astronomers and others who had tedious and abstruse problems to work out.

(*Continued on page 32*)

The third stride forward in the art of mechanical mathematics. Bollee's machine, 1896, definitely foreshadowed the modern apliance, indispensable to business, economics and science.

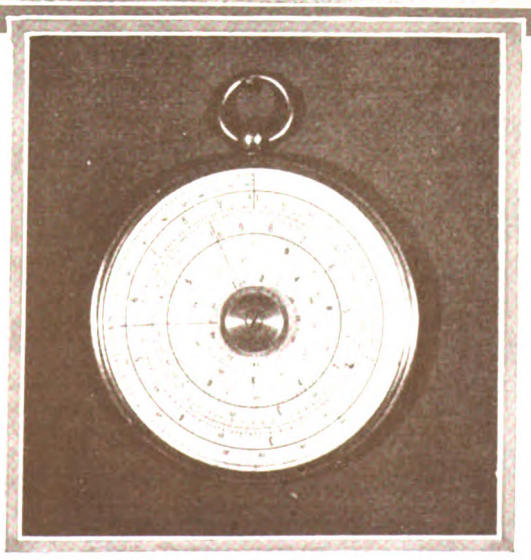


"The Millionaire," a Swiss invention, 1896, developed from Bollee's machine.





Halden's pocket calculator, invented 1906, is useful to many men whose observations and notes, made in the field, are rendered more accurate in themselves and less liable to errors in transcription by draftsmen when they are enabled to send in the initial calculations all worked out, rather than rough notes, sketches and figures, often illegible, and with no opportunity to check chance errors on the ground.



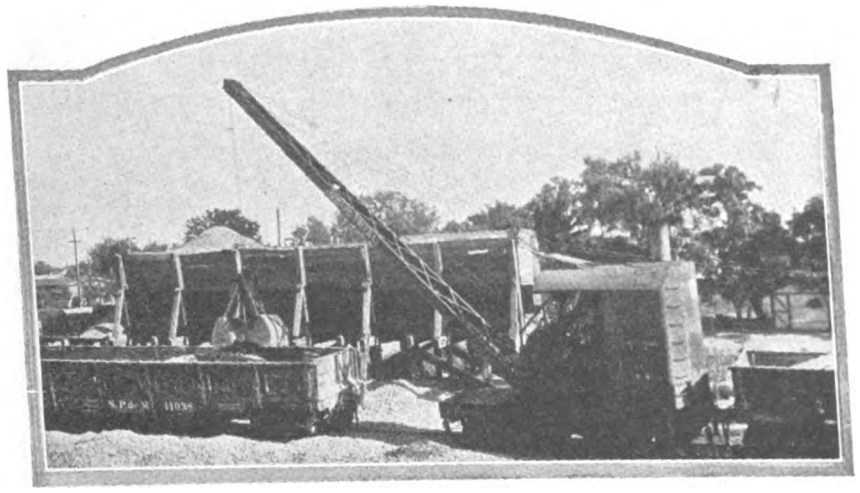
One of the many modern adding and calculating machines which juggle figures as few people can. With transactions nowadays of such magnitude that they commonly run into ten and twelve figures, and with margins of profit and loss so narrow that accuracy must run into several decimal places, 20th century business could not exist without this mechanical brain.

Digitized by Google

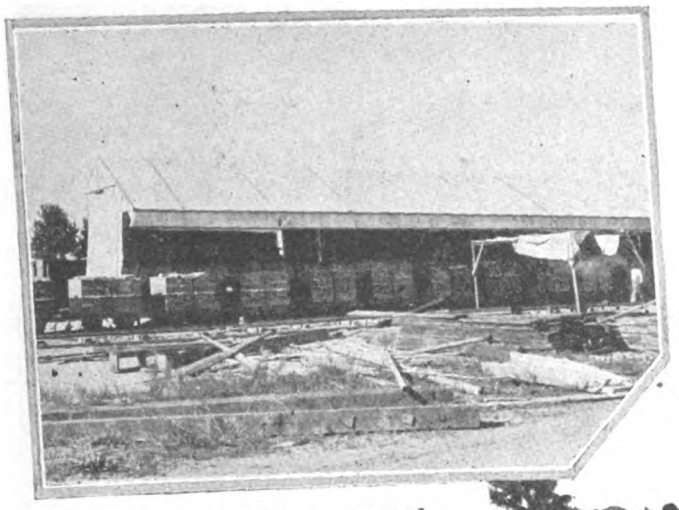
How Machinery Builds Roads

THE accompanying photographs show some interesting details of the largest concrete road-building project ever attempted by one contractor as one job. The work is being done by Twohy Brothers of Seattle, Washington, and Phoenix, Arizona. This year they will complete 187 miles of concrete highway 16 feet wide and 5 and 8 inches thick. Last year they completed a contract for 130 miles in the same county.

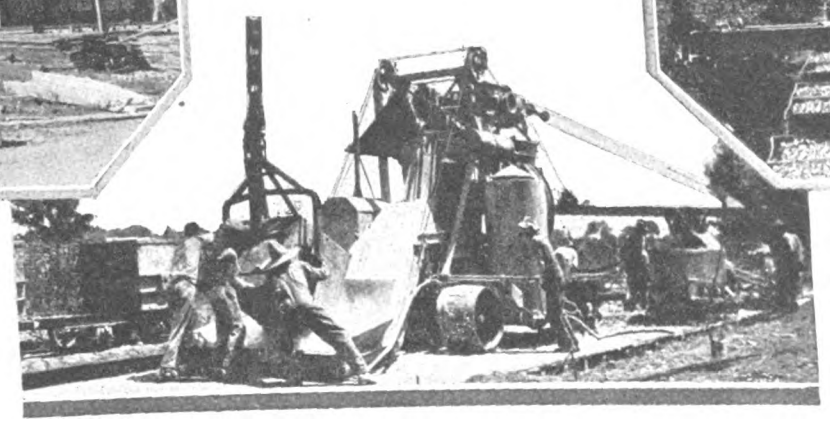
All of these roads are in Maricopa County, Arizona, of which the city of Phoenix is the county seat. It is the most densely populated county in the State of Arizona. When the project is completed, no farmer in the general vicinity of this network of highways will be more than one mile from a concrete road.



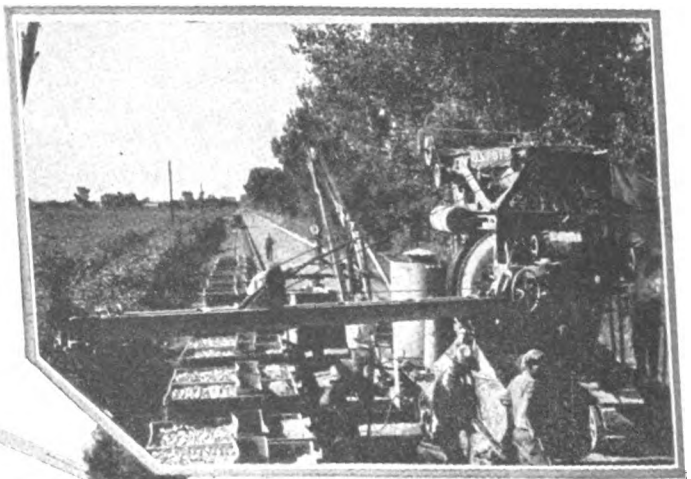
Gravel is brought by rail from the bed of the Salt River and transferred by crane to proportioning bins. From these bins, the materials are spouted to batch boxes mounted on industrial cars and then conveyed to the job.



Here are the batch boxes mounted on industrial cars passing the cement shed. Four bags of cement are dumped into each batch box, or just enough for one complete batch in the concrete mixer.



The boxes are then transferred by means of a derrick attached to the paver, to the charging skip, each box containing a proper proportion of sand, gravel and cement for a complete batch.



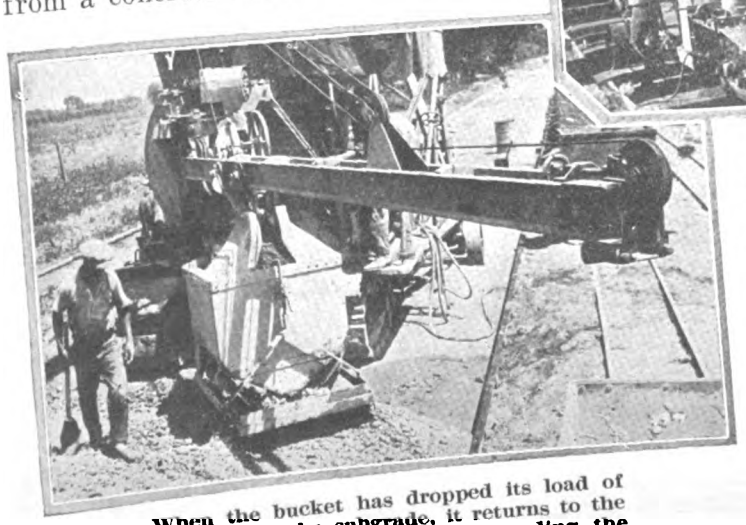
Arrival of the batch boxes at the paver.

When one considers that many paving contractors do only ten to twenty miles of concrete paving in a season, it gives some idea of the extent of the work being done in Maricopa County.

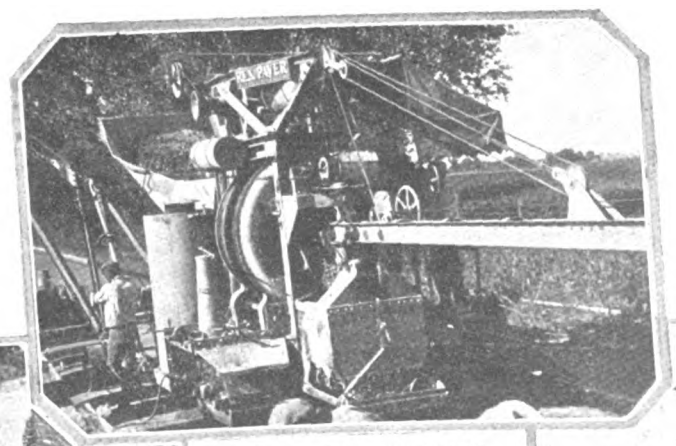
Not the least interesting thing about the job is the speed at which the work is being handled. As high as 114 lineal feet of highway have been laid in one hour, using what contractors know as four-bag batch of 1-2-4 mix. This means that for every one bag of cement, there are two cubic feet of sand and four cubic feet of gravel.

Four times this quantity is put into the paver for each batch of concrete. The specifications of the highway department in the State of Arizona call for a mixing period of one full miute for each batch of concrete. The contractors

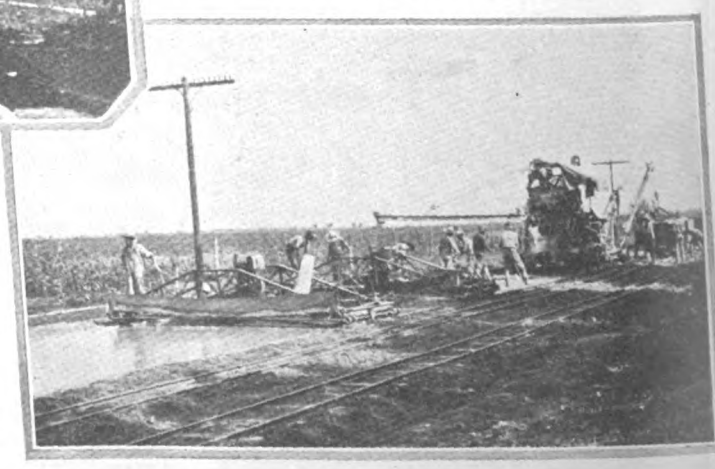
(*Continued on page 30*)



When the bucket has dropped its load of concrete on the subgrade, it returns to the machine at the same time spreading the concrete by means of the spreader attachment which is seen in the foreground. This spreader saves both time and labor.



After the materials have been dumped into the skip, the skip is raised and the materials pass into the drum. When properly mixed, they are discharged from the drum into the distributing bucket, which is shown in the foreground of this picture. You will note that the drum is discharging into the bucket during the period when the skip is being raised. This accounts for the great speed at which the concrete highways in Maricopa County are being laid.



A general view of one of the jobs from the finishing end. In the foreground may be seen some of the finished concrete over which the tamping machine has just passed.

Digitized by Google



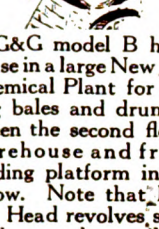
A G&G model B hoist is in use in a large New Jersey Chemical Plant for handling bales and drums between the second floor of warehouse and freight loading platform in yard below. Note that Hoisting Head revolves, so that load may be easily deposited on floor inside building.



Another model B Hoist is in use in a Western paper box factory for handling loads between floors. Note that loaded floor truck is picked up bodily. G&G brake device permits absolute control while lowering by gravity.



A Brooklyn, New York, machine tool factory used a model D G&G Hoist for removing ashes from cellar directly into truck without rehandling at grade. This Hoist operated by electric power, and tests show it raises and lowers 78 cans in one k.w.h. hour.



This model E G&G Electric Hoist is in use in Washington, D. C., for raising bales of paper, and so forth, from cellar to sidewalk level. The model E Hoist is extremely economical in the consumption of current. A recent test at an installation in a New York Telephone Company building shows that 15½ tons of ashes can be raised in one k.w.h. costing the user about 3½ cents.



Your Factory Needs This Hoist

THE G&G Hoist above illustrated is one of the four in use at the Packard Motor Car Company's plant in Detroit. In this instance core sand is being raised a height of one floor, but there are many other uses for this Hoist, such as the handling of boxes, bales, barrels, floor trucks, etc.

Note the ease with which *one man* can do the work with this Hoist. But little pressure is required on the Hoist Handle to raise the average light factory load *by hand*.

It is significant that the Packard plant found the first two G&G Hoists installed so satisfactory that two additional hoists were ordered without solicitation.

The hoist problem differs in practically every factory. Therefore G&G Hoists are made in a variety of styles to meet every need.

If you will tell us what loads you are handling, our Engineering Department will be glad to recommend the model best suited to your individual requirements.



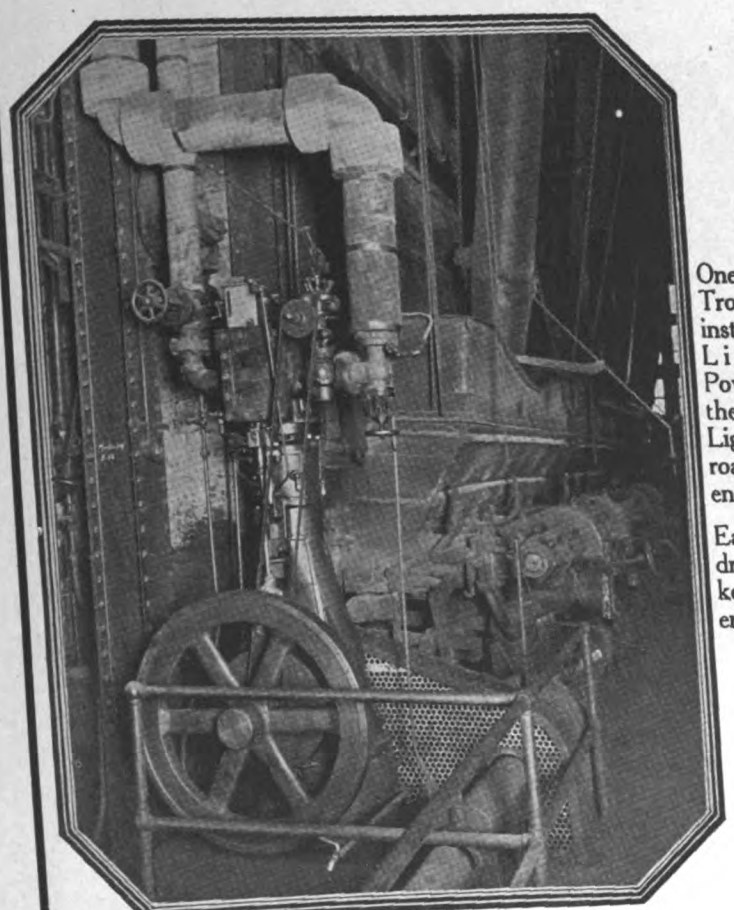
Write for free booklet "Industrial Plants Need This Hoist."

GILLIS & GEOGHEGAN, 556 West Broadway, New York

Digitized by Google

TROY ENGINES

ONLY STEAM ENGINES GOOD ENGINES ONLY



One of the two Troy Engines installed at the Livingston Power Plant of the Richmond Light and Railroad Co., Staten Island, N. Y.

Each engine drives the stokers of 10 boilers.

Twenty months continuous duty and good for years to come

Two 30 H.P., 8" x 8" Throttling Self Oiling Troy Engines were installed at the Livingston Power Plant in May 1921.

They have been giving continuous dependable service—responding to every excess demand of peak load conditions and have required almost no attention.

The Self oiling system, the balanced valves, absolutely leakless and practically indistructible, the rugged design—these and other exclusive Troy features make Troy Engines the national choice where small engines are required.

Write for the Troy Catalog

TROY ENGINE & MACHINE CO.,

TROY, PENNSYLVANIA

Handling Coal and Ashes on the Pivoted Bucket Carrier

(*Continued from Page 21*)

not be as satisfactory as desired. This is not only true of the general arrangement but also of the details of the equipment, for probably in no class of conveying and elevating machinery is the design and construction of details of more importance. Machinery here is subjected to unusual conditions of wear and corrosion, and two equipments very similar in appearance may give very different results in actual operation, a great deal depending on small details in design and construction. The economical operation of the plant will therefore depend to a great extent on the integrity and experience of the engineers and manufacturers.

The storage problem is usually divided into two classes; the active storage, to take care of the more immediate needs, and usually consisting of overhead bunkers or bins of some type from which the coal is shot by gravity to the stokers; and a reserve storage large enough to eliminate any danger of suspended operation of the plant. The reserve storage is usually a rather variable problem, depending upon the amount of storage required and the space available.

For the solution of these problems there is quite a variety of efficient and economical equipment, each best suited to some special case, such as electrically operated buckets on mono-rail tracks, locomotive cranes, gantry cranes, power scoops, conveying equipment, etc.

But when it comes to the handling of the coal and ashes in the power house, we have a very different problem. In all but very rare cases the coal has to be elevated from the track hopper and crusher to the overhead bunkers, and then distributed along this bunker or bin; and the ashes must be collected from under each boiler, and conveyed and elevated to a storage bin over the railway siding, or to some other point of disposal. Where real economy and efficiency are desired, one type of equipment worth considering is the pivoted bucket carrier. It is elevator and conveyor in one, and is undoubtedly one of the highest developments in the art of mechanically handling material.

Figure 2 illustrates a typical installation where the coal is carried from the crusher below the track hopper, and distributed over the length of the overhead bin, from which it is spouted by gravity to the automatic stokers. When the overhead bin is filled, the gates of the ash hoppers under the boilers are opened, and the ashes discharged onto the lower strand of the carrier, by which it is conveyed and elevated to the ash storage bin over the railway siding. It will be noticed in the illustration that this particular carrier maintains the buckets in their carrying position, whether traveling horizontally or vertically, up or down and this is true of this particular type regardless of the path taken.

A pivoted-bucket carrier consists essentially of a continous series of buckets pivotally suspended between two specially designed endless chains. The outstanding advantages of this carrier are:

1. The material is carried, and the buckets are supported by rollers. Destructive friction and injury to the material itself is therefore eliminated, and the power required for operation reduced to the minimum.

2. The ability of the one machine to elevate and convey avoids transfers, which are always troublesome, take up valuable space and necessitate deep pits. The driving connections are also correspondingly simplified.

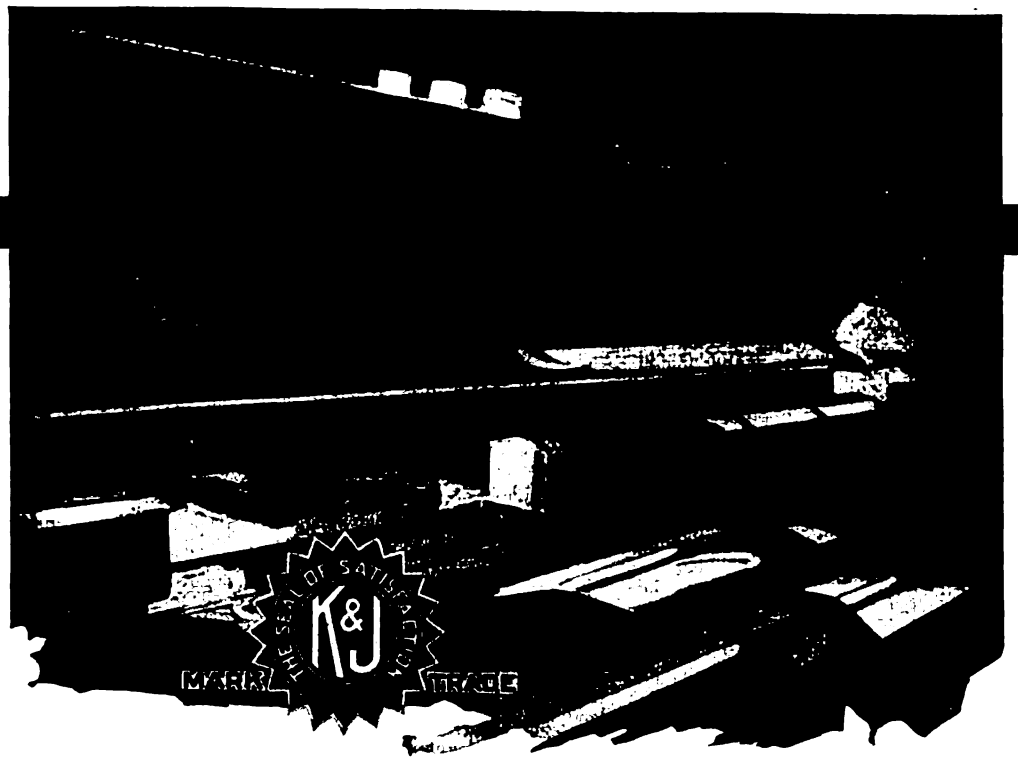
3. The material is readily discharged at any desired point.

4. Their operation is silent, and as they are run at slow speed there is no vibration.

Simple as the design of this carrier appears at first sight, it has had much thought and time expended on its development, by many of the foremost elevating and conveying engineers in the country. The earlier types merely had the buckets hung as close together as was practicable, to prevent material as delivered to them

(*Continued on Page 30*)

Digitized by Google



Write for Bulletin No. 510

Hyatt Roller Bearings are standard equipment on "K & J" Standard Trailers—

Freight House Costs Interest Everyone—

Practically all kinds of merchandise must go through the freight house or across the dock. If there's a waste in operating costs at these points all merchandise pays part of it.

Naturally all business is interested in the methods adopted at these important points. "K & J" Trailer Trains with tractor are being adopted widely for such use and their highly satisfactory results are plain for business executives to see.

You approve of the adoption of these modern systems at such points yet perhaps continue with the less modern methods yourself.

The savings you might make in your own plant by means of modern trailer-tractor systems is far greater than your pro-rata of freight house economies.

It is far more important to you, individually, to stop material-hauling wastes on your product in your own plant.

Let us tell you of the remarkable cost-cutting records that have been made with "K & J" Trailer Trains.

This is a plan drawing of "K & J" Standard Trailer, Type 122W.

Note the specialized principles of construction of this unit.

Note the two-point load support at each large wheel.

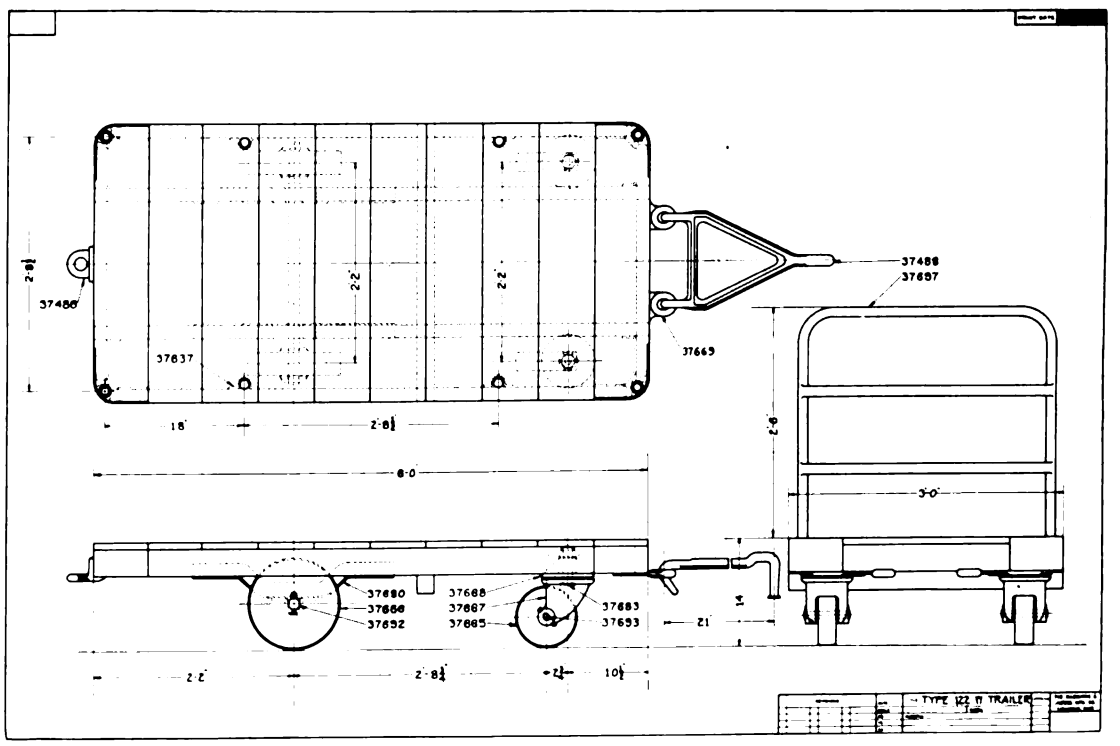
Four heavy, lengthwise beams or sills support platform.

Frame unit is rigidly tied by corner brackets secured to center sill as well as side sill.

Heavy caster unit of top plate type turning on wide ball race.

Wheels and caster jaws of semi-steel. Approx weight, 450 pounds.

"K & J" standard Trailers are made in many capacities. Special designs of all types are furnished.



The Kilbourne & Jacobs Mfg. Company, Columbus, Ohio, U. S. A.

NEW YORK OFFICES, 120 BROADWAY

Digitized by Google



SAFE!

Tremendous heat has little effect. A fall, plus the crushing load of collapsing walls, is successfully withstood by Globe Structural Strength Safes.

There is not enough combustible material in any fireproof building to harm this safe. However any building, not fireproof, will collapse when subjected to intense heat for an hour. A safe, therefore, loaded heavily with records, must withstand a severe fall and the tremendous impact of crumbling walls and other heavy materials.

Globe Structural Strength Safes

Have proven in every fire that they do possess the necessary inbuilt Structural Strength. In the recent disastrous fire in the Austin Bldg., Chicago, a Structural Strength safe fell six floors to the basement where it was completely buried by falling walls and heavy debris. Days later, when workmen dug it out, its contents were found to be safely intact. It is the Structural Strength plus the heat resisting qualities that enable Globe Safes to stand up under such extreme tests.

Send This Coupon

The Globe-Wernicke Co.
Dept. I. I. No. 80
Cincinnati, O.

Please send without charge your catalog, Sales—Structural Strength Models. All sizes.

Name .....

Address .....

Globe-Wernicke
"BUILT TO ENDURE"
FILES BOOKCASES SAFES
Cincinnati
Main Office

Agencies or branches in all cities

(*Continued from Page 28*)

from falling between; but even when an actual contact existed initally, the natural wear and elongation of the chains caused an increasing separation, permitting the sifting of material between the buckets, so that, in the aggregate of a day's run, this amounted to a large quantity of material that had to be cleaned up.

A great many devices have been tried to overcome this difficulty; some ingenious, many complicated and cumbersome, most of them abandoned after a few installations; and all failures as compared with the one simple, obvious and entirely successful plan of using overlapping lips on the bucket. The advantage of this lip is now generally recognized as an essential feature of modern installations. The use of this lip, however, introduces a mechanical difficulty, illustrated on Figure 3. In some types of carrier the difficulty is overcome by reversing the direction of travel, that is, referring to Figure 3, the buckets travel up in their carrying position shown at the right, and, after dumping on the top horizontal run, are completely inverted, so as to return on the vertical run, as those shown at the left of the illustration, ready to receive their load again on the lower horizontal run. If they are not completely inverted after dumping, they would return to the lower horizontal run upside down. In other types of this carrier a special mechanism, exterior to the carrier itself, is employed, which tilts the buckets before they enter the lower run, and reverses their lap, as shown in Figure 4. In this type the buckets are in the proper position for carrying on both the horizontal and vertical runs. There is another type of pivoted-bucket carrier on the market, so constructed that the buckets can, if it is desired, make a complete cycle of travel without being titled or discharged.

It is just as well not to completely invert the buckets in dumping, as this only adds to the wear and tear by banging the buckets unnecessarily. Some simple device which tips the buckets just sufficiently to secure a perfect discharge and then returns them, by means of a cam on the side of the bucket, is often used. The trippers for dumping the buckets can be either fixed or of a movable type, and may be moved to any position on the horizontal run, raised to the operative position, for dumping, or lowered to the inoperative position, to allow the buckets to pass. There are also automatic trippers that have a slow continuous travel, reversing automatically at either end of the path.

Although the pivoted-bucket carrier is best known for handling coal and ashes in the power plant and locomotive coaling station, it is also used to advantage for handling sand, gravel, cement clinker, crushed stone, and in fact almost any class of material capable of being handled in buckets. It is a case where higher first cost may be true economy. A good carrier, probably not the cheapest initially, should under ordinary conditions cost little or nothing for maintenance for many years.

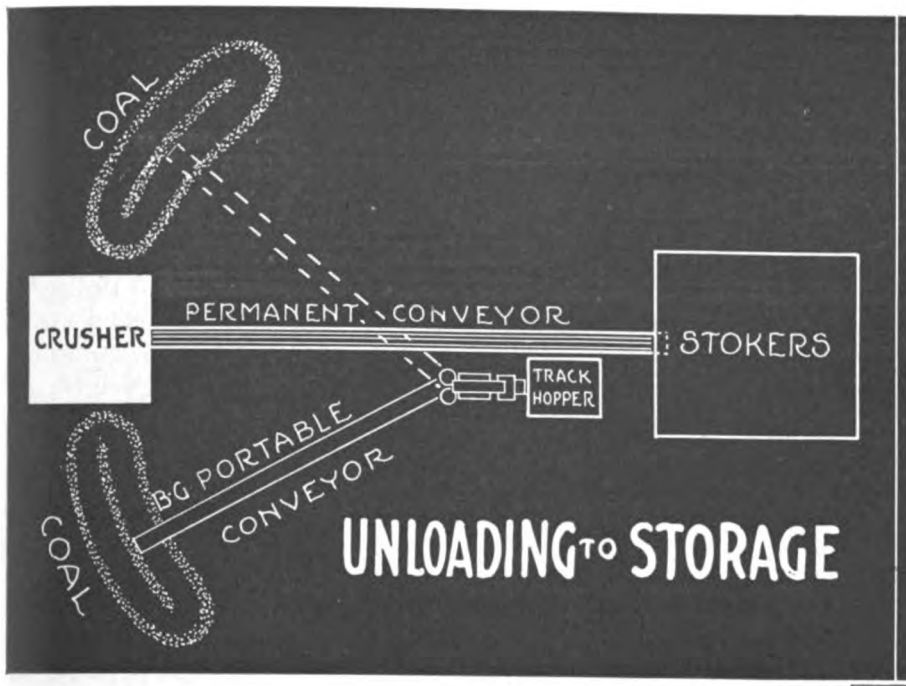
How Machinery Builds Roads

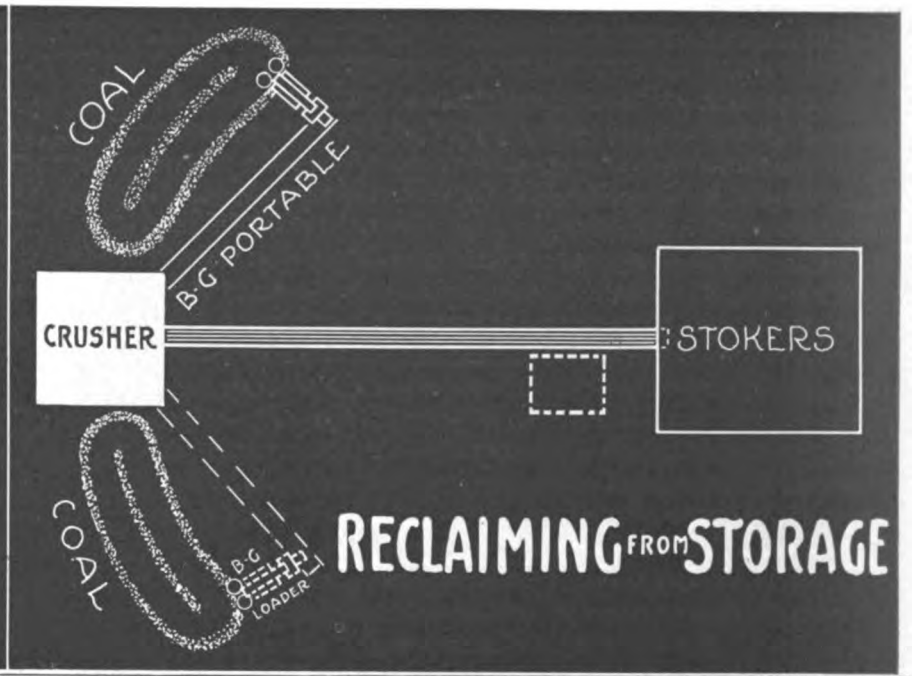
(*Continued from Page 26*

have been able to turn out consecutive batches in as low as 70 seconds, which includes the time for charging the mixer and the time for removing the mixed concrete from the drum. Thus, it is seen that only 10 seconds is consumed in handling a complete batch, 28 cubic feet of unmixed aggregates, a really remarkable performance.

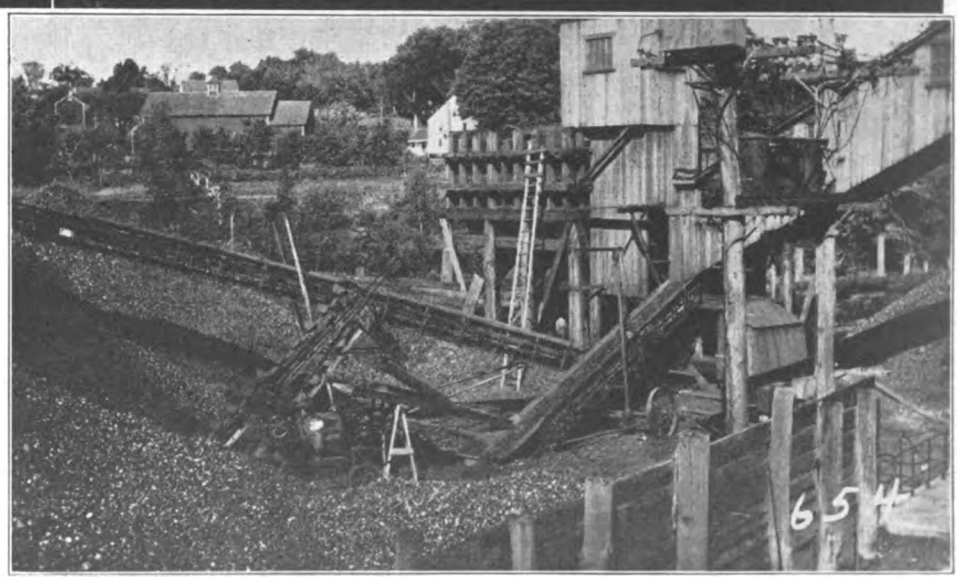
In order to maintain this unusual speed the machine operator must be very alert. While he is discharging one batch from the machine, the material for the next batch is being raised in the charging skip. This is illustrated in the photograph at the bottom of the opening page of this article, which shows the concrete passing from the drum to the distributing bucket, while the charging skip is hoisting the next batch.

Digitized by Google





Making "Necessary Evils" Unnecessary



The cost of a night shift for handling the coal required by their seven units of 125 horse power each had always been taken for granted by the Collins Mfg. Co., of North Wilbraham, Mass. Demurrage on coal cars and difficulty in getting labor were also accepted as necessary evils.

They thought they had no coal-handling problem at all.

That's what they told a Barber-Greene engineer when he called.

After he had studied their layout and they had put his recommendations into effect, they found that former "necessary evils" were unnecessary.

Where they used to have a coal-handling night shift, one man feeds the boilers all night long, and the power house pay roll is shorter by ten names.

Instead of paying demurrage on many cars, Barber-Greene Portable Conveyors and a Barber-Greene Bucket Loader carried the coal from a track hopper directly to the crusher or to storage piles. From the crusher it went, via Barber-Greene, either to a storage bin or direct to the boilers. From the storage pile it was also sent on its course via Barber-Greene.

In addition to saving ten men and doing without a night gang, they found that four men could unload a 60-ton car in 30 minutes. The loader operator, with one helper, could put 50 tons through the crusher in 1 hour and 15 minutes. Demurrage charges due to the difficulty of getting labor when cars accumulated, disappeared entirely.

Many other power plants, both large and small, have done similar things with the help of Barber-Greene portable loaders and conveyors, and recommendations for their use as made by a Barber-Greene engineer.

Send for the "E" catalogue and "E" cost reports by tearing out this page and writing your name and address on it.

BARBER-GREENE COMPANY,

470 W. PARK AVENUE
AURORA, ILLINOIS

Branch Offices in 33 Cities

BARBER-GREENE

Self-Feeding Bucket Loaders
Portable Belt Conveyors

Digitized by Google



Save Floor Space—

use the ceiling.

Do your trucking overhead and make the ceiling pay more on the investment.

Many firms are daily realizing the fact that **Cleveland Tramrails** have reduced their material handling costs to the lowest possible point.

You too, can enjoy these low costs.

There is a standardized **Cleveland Tramrail**—either hand or electric—that will adapt itself to your particular type of hoisting and conveying.

Let us hear from you. May we have this privilege?

CLEVELAND ELECTRIC TRAMRAIL

Builders of
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE OHIO

Sales Offices:

50 Church Street. New York City
Farmers Bank Bldg. Pittsburgh, Pa
1418 First Nat. Bank Bldg. Chicago, Ill.
149 E. Larned St. Detroit, Mich.

CLEVELAND HAND OR ELECTRIC TRAMRAILS

Getting Figures That Can Not Lie

(*Continued from page 25*)

The Englishman, Babbage, with the same purpose, persuaded the British Government, in 1823, to supply him with funds to develop a "differential calculating engine." It was as ponderous as its name, and never reached the practical stage although some years of time and nearly $100,000 in money were expended on it. Babbage's contributions to the art, however, were important, particularly the idea of recording the steps of the calculation as well as the final result. He took his inspiration from the Jacquard loom in which the needles are actuated to produce the most complicated patterns by means of perforations in a card or a strip of paper. Starting with the same inspiration, another line of inventors eventually produced the player piano, the automatic typewriter and the monotype typesetting machine.

Success was achieved in 1820 by the Alsatian, Charles Xavier Thomas de Colmar, commonly known as Thomas. He invented the first machine which would actually solve any arithmetical proposition. He called it an arithmometer, and, under that name, as improved by Tate and others, it is still used both in Europe and this country. Thomas's originality consisted in using endless ribbons running over wheels, operated by finger grips on each ribbon, thus breaking away from the Pascal dial principle.

With inventors constantly groping for principles and mechanism, another considerable period of years elapsed before a practical improvement was achieved. Roth's calculator, in dial form, invented about 1841, and Maurel and Jayett's rather complicated and bulky machine (1847), were among the attempts made to improve on Pascal's method. The Russian mathematician, Tchebycher, (1871) seems to have adopted something of Pascal's invention and combined it with Thomas's idea. Bollee, a Frenchman, who received his U. S. patent in 1886 and his French letters in 1889, produced a calculating machine which, in its principles and in the workmanship it embodied, foreshadowed the present-day machine. Bollee's machine never reached the stage of commercial manufacture, but a Swiss, Steiger, a few years later utilized his principle in producing a calculator along novel lines, in cylindrical form, called the "Millionaire."

It is instructive to note how better facilities enabled these later inventors to produce the necessarily fine and delicate parts with sufficient accuracy and strength for the purpose; Burroughs, in fact, using the microscope in drafting and the micrometer in his machining. The earlier attempts were handicapped by the absence of these precision instruments and finely adjustable machine tools, as well as by lack of knowledge of the proper raw materials to use.

Meanwhile in America, as already remarked, inventors were striking out along a somewhat different line, both in object and method. D. D. Permalee in 1850 patented a machine operated by the depressing of keys which could only add a single column of figures. The first U. S. patent for an arithmetical recording machine was issued to Barbour in 1872. In the '80s both Burroughs and Felt were at work, the one on the so-called listing, adding machine, the other on the non-listing, calculating machine. They reached the production stage in the early '90s, and since then their history has been that of highly successful commercial enterprises, their problems the problems of adaptation and merchandising. There are in use today some dozen or more different models of adding and calculating machines. One, which has its distinct uses in a definite field, is the pocket calculator invented by Halden in 1906, and shown among the accompanying illustrations. But, from the simple refinement of Pascal's original model to the most elaborate machine which adds and subtracts, multiplies and divides, extracts the square root and the cube root,—seems to do

(*Continued on page 34*)

Digitized by Google

When the years have come and gone



Time sweeps his sickle back and forth relentlessly; new buildings age, the doorways sag; under the beating rain, the weight of snow, and the tearing of the wind, the roof gives way—unless it is made of Bonanza "Cementile." In which event the roof remains intact, outlasts the building, is impervious to the attacks of time, if conditions are anyways near normal.

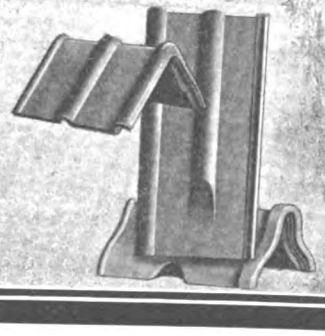
No idle boast, this, but truth. "Cementiles" are slabs of steel-reinforced concrete. They grow stronger with the passing of the years; their molecules knit more firmly together.

There is nothing to wear out or rust away, no repairs to be made. Even fire will not ordinarily harm the roof. One initial cost and you forget about a "Cementile" roof.

What a sense of work well done to know that when the years have come and gone, when,—alas!—you have given your work into the hands of those who follow, the Bonanza "Cementile" roof on your buildings will still be serving faithfully, unharmed by the flight of time.

Our catalogue and data sheets will interest you. Send for them today.

BONANZA CEMENTILE



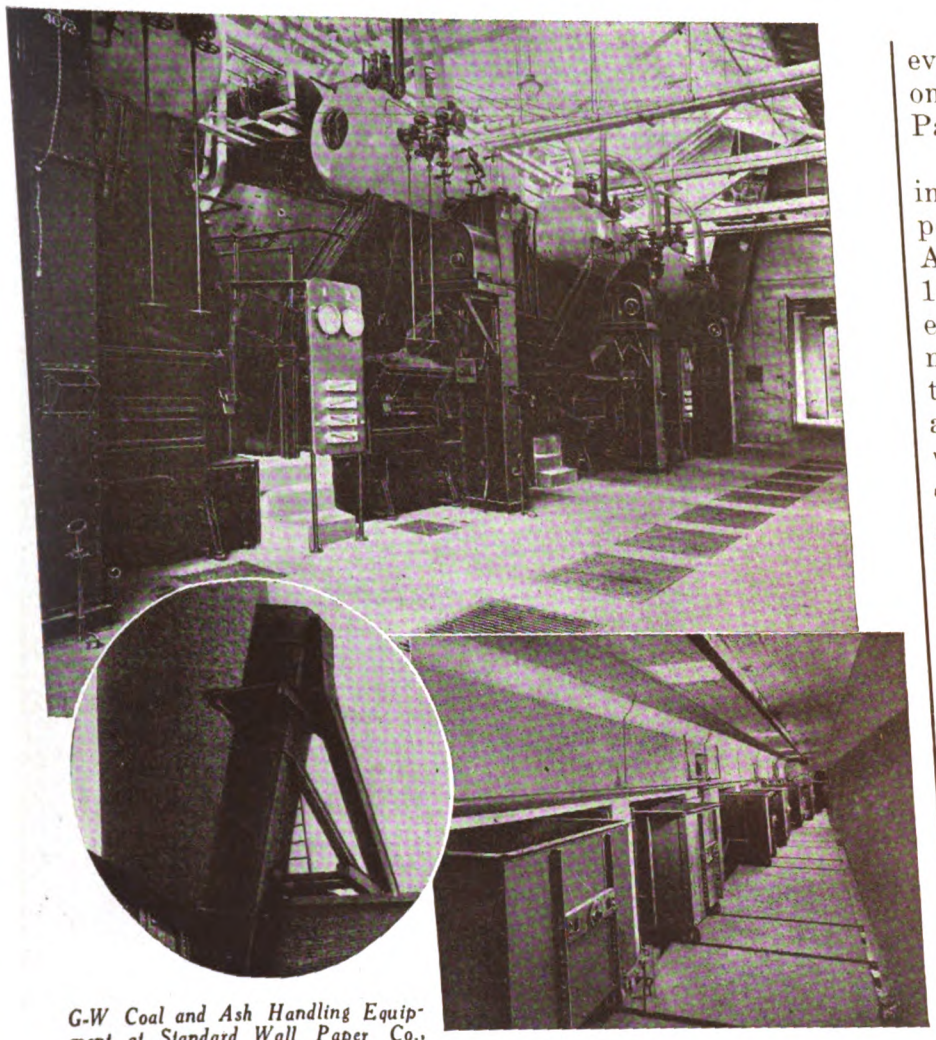
American Cement Tile Manufacturing Co.

831 *Oliver Building, Pittsburgh, Pa.*

PLANTS: Wampum, Pa. Lincoln, N. J. · Birmingham, Ala.

OFFICES: Pittsburgh · New York · Philadelphia · Cleveland · Birmingham

Digitized by Google



G-W Coal and Ash Handling Equipment at Standard Wall Paper Co., Hudson Falls, N. Y.

BUILT STRONGER LASTS LONGER

Thousands of Dollars Saved Through Simple But Improved Coal and Ash Handling Methods

Are you saving, too? Or are you handling your coal and ashes with old-fashioned, inefficient equipment or by the manual method, with its wastefulness in time, labor and money?

That worth while coal and ash handling economies can be effected through the use of simply constructed machinery is well illustrated by the G-W Equipment pictured above. Here, four motor-driven coal elevators take coal from underground storage beneath the boiler room floor, discharging direct to the stokers. All quickly and automatically done—no labor involved.

Ashes discharge from grates into ash carts. These carts when full are picked up by means of a trolley, pushed along to the ash elevator while suspended, and dumped. The elevator then automatically carries the ashes to an ash tank, where they finally discharge into a truck and are carried away.

May we cooperate in effecting coal and ash handling economies for you too? At your request we'll gladly have a G-W representative visit your plant. He would look into your coal and ash handling problem, point out possible economies, and give you complete information regarding G-W Equipment. This service would entail no obligation.

MAIN OFFICE and WORKS: HUDSON, N. Y.
New York Chicago Boston Buffalo

Gifford-Wood Co.

COAL HANDLING EQUIPMENT

(Continued from page 32)

everything but think,—every one of them owes something to Pascal, Thomas or Bollee.

The function of the calculating machine today is indispensable. The auditor of the Austria Northern Railway in 1899 was jubilant upon discovering that with an American machine one of his clerks did the work of two or three men, and eliminated the errors which were a constant source of annoyance and actual danger, even when all computations were performed by two men, whose carefulness was reinforced by fines. President Eliot of Harvard once said, "a man ought not to be employed at a task which a machine can perform," and that ideal is being practically applied by the constant and rapid enlargement of the field occupied by calculating machines in the performance of mathematical operations of almost inconceivable variety. To the ordinary observer the mention of an adding machine means the simple listing and addition of his cancelled checks which he receives each month from his bank. But merely to set down the other uses to which clever inventors and clever operators have adapted this wonderful device, in its many up to date forms, would require more space than can be allotted to this entire article. The writer can remember when the makers themselves figured that the adding machine was a profitable investment only in an office where at least four bookkeepers were at work. Noadays, hardly any corner store is regarded as too small for a typewriter, a cash register and an adding machine. It is even suggested that the study of mathematics in schools and colleges must undergo a considerable change; comprehending the principles and applications of the calculating machine as eliminating the tedium and errors of mere lengthy calculations and educating the student better in the mathematical principles he needs to know because his processes of thought are not thrown off the track by mere drudgery, fatigue and accidental slips in simple steps. So the device seems to be completing the circle of its evolution, arriving in practice at the idea with which it started: that of a machine which should aid, not the merchant who was beneath notice with his simple arithmetical problems, but the scientist and student whose computations were on a higher plane in principle and complexity.

Nowadays, thanks to this machine, the engineer is able to assert that the long and tedious computations required to reduce his observations to a working basis lower his output of constructive brain work, and it is difficult for him to imagine an engineering office which would tolerate that now unnecessary inefficiency. Except for higher mathematics there is no engineering calculation which cannot be performed with greater speed and accuracy by machine than by mind and fingers. Even in the difficult field of mining engineering, survey parties take a machine with them into the field and work up all calculations from their field notes before sending them in to the home office so that the draftsmen can go directly to work with their drawings. The U. S. Geological Survey uses them, for example, in recording the voluminous figures of stream-flow, so essential to hydro-electric development. On the great irrigation projects the ditch-riders keep track of the water used by each farmer by means of this device.

The big bakeries use them. The paper mills and cotton mills compute and classify their complicated products with them. Railroads could not be run without them in these days when their figures run into a dozen places both ways from the decimal point. Printers, pumping stations, building contractors, paymasters, cost accountants, grain brokers, creameries and dairies, department stores and lumber concerns, depend on them for the knowledge of their operations which means the difference between profit and loss.

Their adaptation already is comprehensive. If you work with twelve-column figures, with decimals, there is a machine ready-made for you. Do you want fractions — fourths, eighths, twelths, double eighths or twelfths, eighths and twelfths, together? Do you use the peculiar enumerations of British money, lumber, glass, feet and inches, dozens

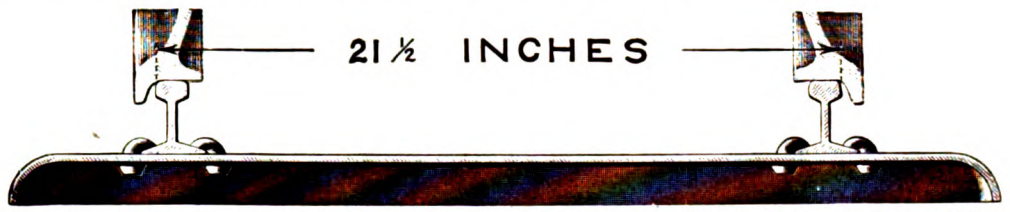
(Continued on page 36)

Digitized by Google

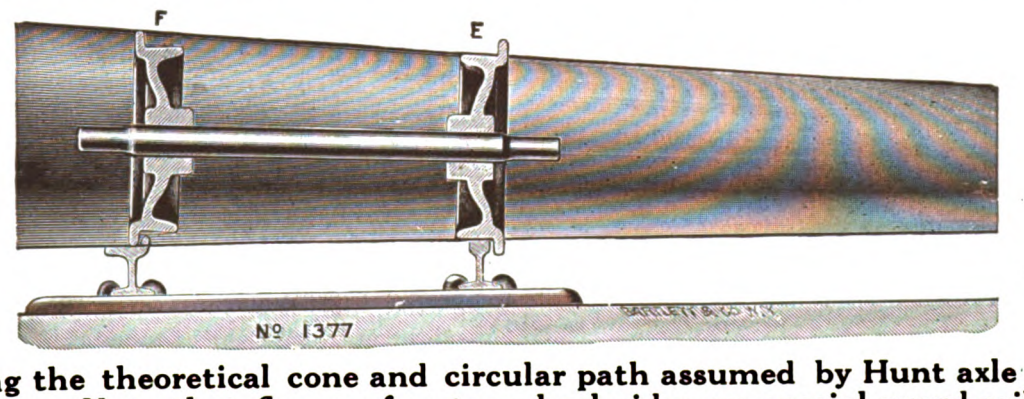
HUNT INDUSTRIAL TRACK and EQUIPMENT

is constructed for every industry and service where the movement of material is essential. ***One man*** can push a ***one ton load*** on a ***Hunt System*** around 12-ft. Radius Curves and Switches as Easily as on Straight Track. The ***secret*** of this Easy Running is in the Construction of the Running Gear, Curves and Switches.

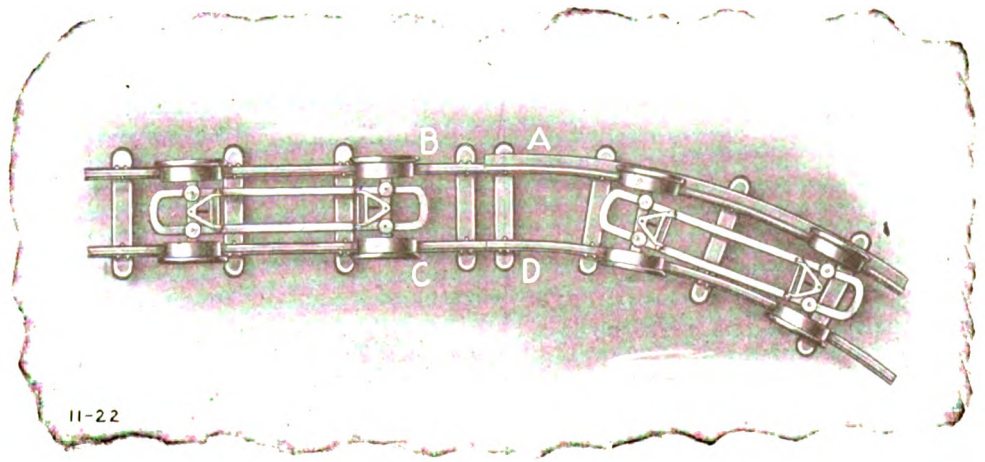
The Gauge of track is 21½ inches, measured from outside to outside of railheads, with the flanges of wheels running on the outside, as illustrated below.



Standard Section of Hunt Track-Rails are Hot Riveted to Ties



Section showing the theoretical cone and circular path assumed by Hunt axle and wheels in rounding a curve. Note that flange of outer wheel rides on special guard rail and tread of inner wheel rides on head of tee rail the same as on straight track, thus forming the cone.



Hunt flexible wheel base showing position of wheels on the straight track and the radial position assumed on the curve

The action of the axles and wheel flanges on Hunt cars in rounding curves is illustrated above. As the car on a straight track approaches the curve, the wheel (B) runs on its flange on the special outer curve rail (A) and the wheel (C) runs on its tread on the inner rail (D). Thus as the axle assumes a radial position there is no slipping on the rails and no sliding friction. Full details will be found in our Industrial Railway Catalogue 22-1. Sent on request.

C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, NEW YORK

New York Office, 143 Liberty Street

Ernest F. Learned
141 Milk St., Boston 9, Mass.

Phillips, Lang & Co., Inc.
538 So. Dearborn St., Chicago, Ill.

Digitized by Google

In *your* factory Eveready Flashlights will prove indispensable in preventing fire and accidents!

For the safety of life and property, Eveready Flashlights are as necessary as a sprinkler system, a fire alarm, or a night watchman. Read the following Eveready advantages—

1. **Lighted instantly,** much quicker than matches
2. **Flameless,** no fire risk
3. **Steady,** unaffected by wind or rain
4. **No wires,** no connections to make
5. **No cord,** nothing to catch in machinery
6. **Concentrated light,** a bright electric beam directly where you want it
7. **Handy to carry,** much smaller and lighter than a lantern

Indispensable in stock rooms, to read labels on barrels and boxes

For accurate measurement reading, temporary measuring devices set up in odd corners

For easy reading of counters, always convenient, often necessary

For quick repairs, often made on the spot

For the company physician, specially designed flashlights for the examination of eye, ear, nose, and throat

For inspection of equipment, as sprinkler heads and other appliances can hardly be examined without a flashlight

Where inflammable liquids and gases are, flashlights are recommended by the Bureau of Explosives as perfectly safe; no sparks, no flame

For the night watchman, who of course should always be equipped with a flashlight

For sale everywhere by electrical, hardware, sporting goods, drug, and auto accessory shops; garages; general stores.

NATIONAL CARBON COMPANY, Inc.
Long Island City, N. Y.

FLASH
& BATTE

(*Continued from page 34*)

and gross, hours, minutes that seconds, and so on? A calculating machine that will handle all those peculiarities is in stock. And you or your employee will be taught thoroughly how to operate the machine in such a way as to utilize its full advantages in accuracy and speed, in disclosing the significance of figures in your business which otherwise may escape notice, because the means of ready analysis is not at hand.

Five Essentials of a Suggestion System

(*Continued from page 22*)

wrecked it in every case will be found to be either its administrative laxness or judicial laxness, or both. The first principle of a successful suggestion system is that it be prompt and efficient in handling all suggestions offered; and the second principle, equally important, is that every precaution be taken to insure fairness (and the appearance of fairness) in decisions and awards.

These principles are obvious and may appear to be easy of application. If they are kept in mind from the beginning of the campaign for suggestions it ought not be difficult to steer clear of the dangers. But the truth is that many suggestion systems have failed, and many are failing today. In more than a few American factories the suggestion system is a standing joke; in some it is sneered at by some of the employees and simply ignored by many of the others. A recent writer in *Industrial Management* mentioned the "suggestion-box-corpse" as something that had better be removed out of sight.

In spite of these failures we are not to conclude that the idea itself is a failure, for it has succeeded amazingly in some plants. It has succeeded not only in bringing out suggestions of improvements and economies that without this stimulus might never be thought of, but also in keying up the interest of the employees, in strengthening their sense of loyalty to the plant, and upbuilding industrial goodwill. Certainly these results are wholesome both for employer and employee, and it is worth while inquiring how they have been brought about.

The information which follows is the result of an analysis of suggestion systems in a dozen industrial plants where the idea has been successful. The systems vary in many details, as will be shown, but all conform to certain conditions which are the essentials of a successful system. These we may list as five "musts" as follows:

1. The suggestion system must have an adequate organization, on the job all the time, and so constituted as to command the confidence of the employees.
2. It must devise and employ suitable means to attract the attention of employees to the opportunities it offers and make it easy for them to submit suggestions.
3. It must be prompt in acknowledging and passing on suggestions and fair in judging and rewarding suggestions.
4. It must give awards sufficient to provide the necessary incentive for extra effort.
5. It must be scrupulously considerate of the human factor in every detail of administering the system.

Each of these requirements may seem a simple, obvious thing, but it is amazing how often they are slighted or mishandled. Take the item fairness, for example. The administration of your system might be incarnate justice, but that wouldn't necessarily mean that the men would accept it as such. It must not only be fair but it must *appear* to be fair, it must give a consistent impression of being fair; and that requires more attention to the fifth "must" than you might ordinarily think necessary.

The first essential is that the suggestion system be properly organized. In a small plant the manager or superintendent may constitute the entire organization, with the help of a clerk to care for the filing, typing and other clerical details. But in a large plant the task of giving proper publicity to the system, of caring for suggestions as they are submit-

(*Continued on page 38*)

Digitized by Google

Hays Man Saves $540.00 Every Month in Fuel Cost

K. R. Williams, of Charleroi, Pa., cuts coal consumption from 15 to 9.2 tons a day. Engineer Shoemaker, another Hays man, cuts 213 tons to 100 tons a month with an even bigger load. Everywhere Hays students are using their practical knowledge of combustion and fuel saving to make amazing cuts in coal bills. My book on Combustion, sent free, will show you the way to similar savings in your plant.

THE question which all power plants are facing this winter is not so much the price of coal as it is "Will we be able to get enough fuel to keep our plant in operation?" Saving fuel becomes more vital than at any other time in the history of our country.

Run through the advertisements in this magazine and you will find countless mechanical devices for increasing fuel efficiency and cutting costs. But remember, that the boiler-room never can function automatically. Before these mechanical stokers, draft gauges, blower regulators, gas analyzers, etc., can be of practical use there must be the human brain of a directing genius who has a fundamental and thorough knowledge of every phase of combustion. It is this human mind which must put into effect the short cuts to fuel saving and higher efficiency. Not only must he know how to correct and eliminate every condition causing waste, but he must be able to command the respect of the men under him and inspire them to the hearty cooperation that is essential before any plant can get the maxium of power from every lump of coal. Every modern plant should have a Combustion Engineer.

Heretofore, the four years of technical training necessary has made Combustion Engineers very hard to find. But now the Hays School of Combustion is prepared to make any man in your plant a Combustion Engineer, an expert in fuel economy without taking a minute from his job. The training is given in his spare time at home. And the results in every case have been amazing.

The records shown in the panel on this page are only a few of the hundreds which we have in our files. But these are not remarkable when you consider the records of the men who prepared this course. Those whose experience is combined in this training are: Jos. W. Hays, well known writer and consulting engineer; Prof. S. W. Parr, of the University of Illinois,—authority on fuel chemistry; Fred R. Low, Editor of "Power;" David Moffat Myers, prominent consulting engineer and formerly of the Fuel Adminstration; Arthur L. Rice, Editor of "Power Plant Engineering"; W. L. Abbott, Commonwealth Edison Co., Chicago; I. E. Moultrop, Edison Elec. Illum. Co., Boston; and Jos. Harrington, stoker expert.

Savings Quickly Noted

"Already I have made a saving recognized by more remuneration." F. E. Burgess, of Philadelphia.

Fuel Efficiency Wins Recognition

"Have had two raises as a result of the savings I have effected since taking the Hays Course." Gordon Kelly, Cambridge, Mass.

$200.00 Saved Here

"In the last two months I have saved $200.00. At least 50% of this was in coal saved." William Weston, another student.

Cut Coal Bill 15%

"I have cut our coal bill 15%." Edw. C. Grove.

Saved 60 Tons In One Month

"Saved 60 tons of coal this September compared with same month last year." George W. Austin, Tuskegee, Ala.

Reduced Consumption 10%

"Have reduced fuel consumption 10%." L. B, Quam, of the Oil Belt Power Company.

Think over now the men in your plant. Which one is the most apt? Which one would you like to have me train to save fuel for you? Either pass this advertisement on to him with the suggestion that he investigate this course, or call him into your office and ask him if he is interested in becoming an expert in his work. Or, better still, investigate this course yourself before mentioning it to your man.

FREE *WHEN SHALL WE MAIL YOUR COPY OF THIS COST CUTTING BOOK?*

Any Man Can Learn How

The course in Combustion and Fuel Efficiency is so interesting, so clearly written that any man of ordinary intelligence—with no better than a common school education—can master it and become as good and as expert a Combustion engineer as though he had spent four years at a technical school. From the very first lesson he learns principles and what is more important, how to apply them at once in his daily work. This is true throughout the course.

Send Coupon Now

But what you are interested in is "How much fuel can I save?" Space forbids details. We have prepared a book which will give you the whole story, tell you all about the course and about the various plans now in use in America's leading plants for training the men to stop the hundreds of little leaks that waste coal. Paste the request printed below to your letterhead and mail it at once. The book will be sent free without cost or obligation.

HAYS SCHOOL OF COMBUSTION
1412-14 S. Michigan Ave. Chicago, Ill.

Hays School of Combustion, Dept. 78
1412-14 S. Michigan Ave.,
Chicago, Illinois.

Send me your Book on Combustion without obligation

Name .....

Address .....

City ..... State .....

Company ..... Position .....

Digitized by Google

Perfected the Works; Lost the Mainspring!

The experts say that cost-reduction, mechanically, is about finished. It has almost finished the worker, by making his job *too* mechanical.

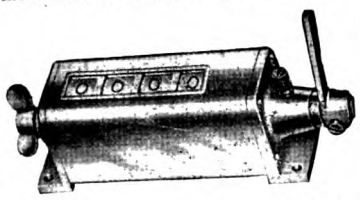
After machinery is all but perfected; after the time of operations has been cut to the last second and rates scaled to the last cent, your men work *mechanically*—without snap!

There's a remedy for this; a way to get a man's pride, interest, initiative and sportsmanship into his job.

Veeder COUNTERS

give him a chance to be a record-beater; a chance to *win* over his own past showings and those of his fellows; a chance to gain a little glory and recognition in his line—***a man's mainspring!***

The Set-Back Rotary Ratchet Counter below is for machines such as punch presses and metal-stamping machines, where a *reciprocating* movement indicates an operation.



Registers one for each throw of the lever, and sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figures, as illustrated, $11.50—subject to discount. (*Cut less than ½ size.*) Set-Back *Revolution* Counter of similar model, $10.00 (list.)

The small Revolution Counter below registers one for a revolution of a shaft, recording a machine operation, or product. Though small, this counter is very durable; its mechanism will stand a very high rate of speed, making it especially suitable for light, fast-running machines, and most adaptable for experimental work. If run backward, the counter subtracts. Price $2.00. (*Cut 3/5 size.*) Small Rotary Ratchet Counter, to register reciprocating movements of small machines, also $2.00



What machines of yours are operated with "lack of punch"? There's a VEEDER for every one of them, fully described in the new Veeder booklet. Write—

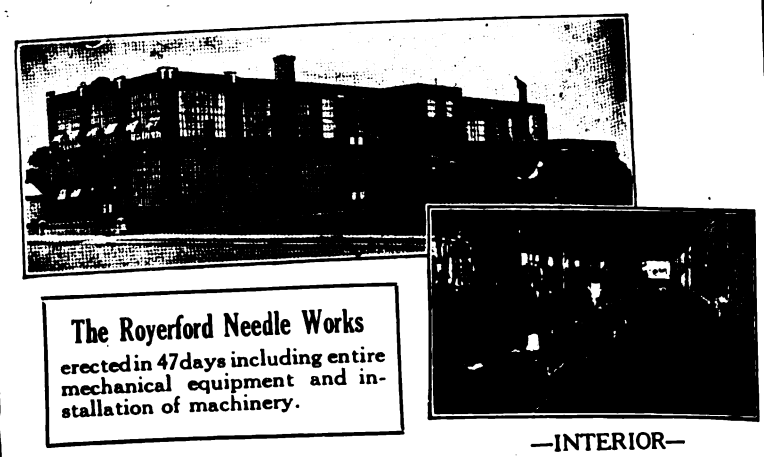
The Veeder Mfg. Co.,
63 Sargeant St., Hartford, Conn.

(Continued from page 36)

ted, investigating them. passing decision on them, fixing awards, announcing results, and the like, would swamp the executive who tried to combine these with his managerial duties. Moreover, one-man authority in judging and rewarding suggestions is dangerous. It is best to have a group of men—"a jury," to borrow a phrase from the letter quoted at the beginning of this article. Hence the prevalence of the committee plan in the organization of successful suggestion systems.

In a large factory whose suggestion system is a model of its kind, all questions of policy and all decisions and awards are made by a Suggestion Committee of eleven members. Under the committee there is a Suggestion Department of five paid employees who devote their entire time to the work—prepare announcements, posters, and other publicity material; record and file suggestions as they are received; acknowledge them; submit them to the committee; announce the results; conduct the necessary correspondence and interviews with suggesters, and in general take care of all the administrative and routine duties. The Committee is carefully chosen to represent every department of the business and consists of the factory superintendent, the controller, the chief engineer, the office supervisor, the manager of the order department, the assistant sales manager, the chief inspector, the efficiency engineer, the supervisor of assembly, one man chosen from the rank and file, and the manager of the suggestion department. (This is the Committee as it was at the time our inqury was made. The personnel is changed from time to time, but it is kept representative.)

In another large manufacturing company the Suggestion Committee consists of eight department heads. In addition, there is a secretary of the Committee who presides over the administrative and routine details, giving his whole time to this work. While the final decision on all ideas submitted is made by the Committee at its fortnightly meetings, the organization plan here includes the reference of each suggestion received to the head



The Royerford Needle Works
erected in 47 days including entire mechanical equipment and installation of machinery.

—INTERIOR—

Your New Building

IT can represent every modern improvement and yet be built in 30 to 90 days at a big saving, if you use Beling-Bush Standardized Buildings. Using our Method, you save because of centralized responsibility and on cost of plans and specifications. Write for booklet and information, and let us estimate.

Minimum Cost *Maximum Service*

***The* BELING~BUSH CO., INC.**
FACTORY ENGINEERS AND BUILDERS
Drexel Building **Philadelphia Pa.**

ALLIGATOR
TRADE MARK REG. U.S. PAT. OFFICE
STEEL BELT LACING

Why Men Change To Alligator

Strength comes first and Alligator is the Strongest Belt Lacing On Earth. Then follow simplicity, permanence, speed of application, range and economy.

On each count "Alligator" is supreme. Easily applied with only a hammer in an average of three minutes time. Makes a permanent, separable, hinged joint. Complete variety of sizes for belts of every thickness. Economical in cost. If you are not now using Alligator, write for sample and our illuminating booklet.

Standardize your plant on Alligator.
Sold through "Jobber Dealer" trade channels the world over.

Flexible Steel Lacing Co.
4639 Lexington St., Chicago, Ill.
In England at 135 Finsbury Pavement, London, E. C., 2.



Digitized by Google

of the department it affects. The report of the department head assists the Committee in passing on the availability and value of the suggestion.

Another company carries the committee idea further. There is a special committee for each division of the business, and to it all suggestions affecting that division are referred. When reports from these special committees are in, final decision is made by the Suggestion Committee. The Suggestion Committee is made up of representative executives; its functions are purely judicial. The administrative and routine work of this suggestion system is carried on as a subdivision of the Department of Personnel and Employment.

Where there is an employee representative plan, the suggestion system is usually under this organization. Thus, a large implement factory in the West has its Suggestion Committee made up of a chairman (who votes only in case of a tie), a secretary (who has no vote and is the office manager for the system), and four members, two of whom represent the management and two the employees. This committee is appointed by the works council, which has the power to recall a member at any time and appoint his successor.

In another western plant where industrial democracy is operative, the Suggestion Committee is a joint body equally representative of the Senate and the House of Representatives. The committee meets weekly to canvass the suggestions received during the previous week, and then submits its recommendations regarding suggestions to the Senate and House, which have the final say in voting awards. In general, this plan has worked well, for the recommendations of the Committee are usually adopted, but there is an element of danger in submitting suggestions for decision to a large assemblage. Moreover the system would seem to be awkard and time-consuming. A New York concern, whose Suggestion Committee is likewise a joint appointment of the Senate and House, gives its Committee full power and responsibility for carrying on the system and making awards; but the acts of the Committee are subject to review by the Cabinet.

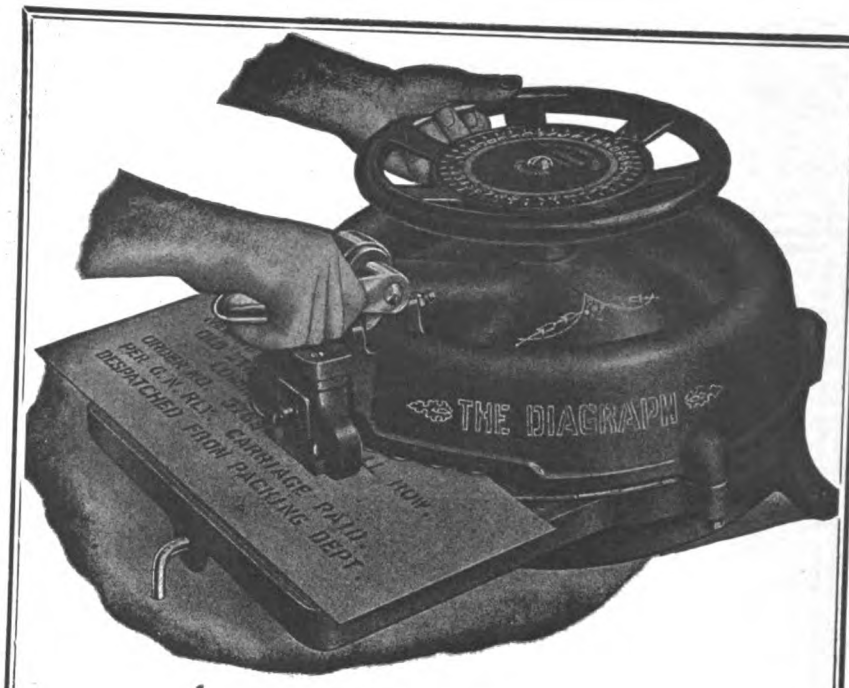
Whatever the general organization of the factory, and irrespective of the size of the force, the committee plan seems the best form of organization for a suggestion system. (A possible exception is a small factory of a dozen or so men, where a committee organization might seem to be top-heavy; but even here it is best to guard against the charge of favoritism by sharing responsibility for judging submitted ideas.) A Suggestion Committee should be a representative body, made up of members from the various departments affected by suggestions, and there should be some provision for appeal and re-hearing by the power that created the committee. The latter provision will provide a necessary safety valve for the dissatisfied competitors, of whom there will normally be some under any system.

No matter how representative and admirable its organization, a suggestion system will not win much coöperation from employees by the mere announcement of its existence. Some beating of the drum and blowing of the horn is necessary, not only at the beginning, but afterward, week in and week out. The suggestion department has to stimulate employees to make suggestions, make it easy for them to do so, and in some cases actually assist them in putting their thoughts down on paper. Some of the devices used are posters and announcements on bulletin boards, articles in company magazines, letters pointing out the opportunity offered by the suggestion system, blank forms for suggestions, and lock boxes at convenient places throughout the factory for the receipt of suggestions.

It is usually a help to give the workers a hint or suggestion as to the kind of suggestions wanted. One large machine works, for example, lists the following headings as a classification of the kinds of suggestions wanted:

1. Improvement of Product and Quantity.
2. Improvement of Quality.
3. Decreasing cost without decreasing wage or lowering quality.
4. Unnecessary duplication of work remedied.
5. Improvement of machine design.

(*Continued on page 41*)



READ
"The Freight That Failed"
By Forrest Crissey

Every business man should read this illuminating article in the May 27th issue of The Saturday Evening Post. Mr. Crissey, in discussing the $100,000,000 annual freight claim losses, states that the use of stencils for addressing is a highly effective means of loss prevention. Read Mr. Crissey's article—then buy a Diagraph. Free trial in your own shipping room.

DIAGRAPH STENCIL MACHINE CORP.
1626 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities—see phone book.

MARBLELOID
The Universal FLOORING for Modern Buildings

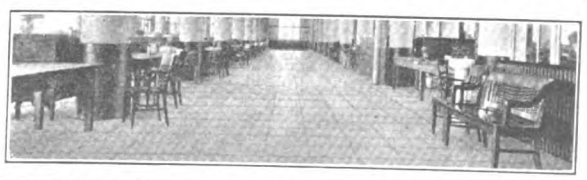
Have you in any office or industrial building a worn floor which needs renewing?

If you have such a floor, the properties of Marbleloid fireproof flooring should interest you—because it is an ideal material for re-surfacing old floors whether they are wood or concrete.

This composition flooring is laid plastic over the old floor and in a few hours you have a strong, warm, smooth-surfaced, modern floor which adds much to the appearance, serviceability and permanence of your building. This Marbleloid Floor will not dust or chip, will be found certain and elastic for walking and will not require any expensive upkeep.

We install each Marbleloid floor as well as manufacture the material and we will guarantee it to please you in attractiveness, longevity, warmth, strength and in all other qualities we claim for it. Let our engineers give you practical floor facts and send floor book. *Use handy coupon below.*

THE MARBLELOID CO., 467 Eighth Ave., N. Y.



THE MARBLELOID COMPANY, New York City: Without obligating myself in any way, please submit tentative estimates on the cost of your product installed complete for our building.....; below are the approximate areas involved.
Floor.....Sq. Ft. Sanitary Base.....Lineal Ft.
Wainscot.....Sq. Ft. I have checked the floor troubles we now have.

Our floors are
[ ] New Concrete [ ] Cement Finish [ ] Wood
[ ] Cracking [ ] Dusting [ ] Noisy
[ ] Cold [ ] Splintering [ ] Rough
[ ] Slippery [ ] Unsanitary [ ] Rotting

Name .....
Firm .....
Address.....
[ ] Please send 32 page Illustrated Booklet

Digitized by Google



More Than Metal

You receive more than a mere assemblage of metal plates and rivets when you purchase a Lancaster Tank.

Every Lancaster Tank is built of more than metal. Twenty years of experience in designing, fabricating and erecting Tanks is *built into* each Tank bearing our name.

Lancaster Tanks may *look* like other Tanks but behind the things you see are the results of our Tank Engineering Service embracing a *specialized* technical knowledge of Tanks and their uses. It is this unseen factor that makes the name Lancaster mean Sturdy, Safe and Economical Tanks.

LANCASTER IRON WORKS, INC.
Lancaster, Penna.

501 Fifth Avenue
New York

Wesley Building
Philadelphia

Give this coupon to your Assistant with instructions to write for any or all of the books checked.

Book B-1	List prices and specifications on 303 sizes of Horizontal Storage Tanks from 100 to 25,000 gallons capacity.
Book B-2	Storage Tanks, sizes from 1,000 to 74,000 barrels capacity.
Book B-3	List prices and specifications of 134 Standard Sizes of Pressure Tanks.

LANCASTER TANKS
STEEL PLATE CONSTRUCTION

Digitized by Google

(*Continued from page 39*)

6. Improvement of design of product.
7. Reduction of labor turnover.
8. Improvement of working conditions.
9. Safety.

A blank form on which suggestions may be written is also important, though there should be no rule preventing a man from submitting his idea on any kind of paper he may desire. The presence of these blank forms at convenient stations throughout the plant is a constant invitation to submit suggestions. Some companies no longer require a suggester to sign his name. The forms are stamped with a serial number which appears also on an attached stub, and when a suggester has written down his idea, he detaches the stub, drops the suggestion in a box or mails it to the committee, and keeps the stub as his means of identification. This scheme has drawn suggestions from many timid persons who were not willing to sign their names—afraid of making a failure, of seeming to criticise the foreman or the mangement, or of appearing to have a "fool idea."

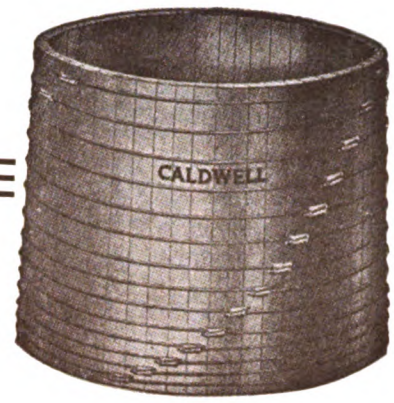
Suggestion boxes are usually placed near the bulletin boards, at entrances, in corridors, and at other conspicuous places. Some factories have worked out ingenious combinations of bulletin board and suggestion box, with compartments to hold blank forms, and a chained pencil attached. One company found that many of its employees didn't like to be seen dropping suggestions into the box; they were afraid of being laughed at. So the boxes were removed from the workrooms and placed on the stair landings. Now one can drop in his paper slip without being seen by anyone, and the number of suggestions has greatly increased. Last year this company received more than 3000 suggestions.

In addition to mechanical conveniences and aids, some personal help should be available to those who want it. Some men can tell their idea and explain it orally, but the task of putting it down on paper discourages them. Sometimes a man with a good suggestion is unable to write, or to write intelligibly in English. There must be some one accessible in the suggestion department to hear his idea and help him put it in shape for submission to the committee. Sometimes a suggestion calls for an accompanying diagram; in many companies the suggestion department can call on a draftsman to assist a suggester in illustrating his idea when this is necessary.

The suggestion department should seek in every way possible to popularize the work it is doing. As soon as a new employee is added to the force, write him a letter explaining the suggestion system and inviting him to contribute. As soon as suggestions are accepted, give full publicity to the fact. Exceptional suggestions should be featured. One company issues a regular bulletin reporting the accepted suggestions, and whenever an unusually valuable suggestion comes through it is made known to the force by a special bulletin. Another company has made a stereoscopic apparatus, something like those seen in penny arcades, and displays in this views of new suggestions, how they operate, and the results accomplished.

The time element is an important factor in keeping up interest. If a man submits a suggestion and hears nothing of it for two or three months, he is likely to be discouraged. He ought to get an acknowledgment immediately, and within a reasonable time he ought to know the fate of his idea. Some companies make daily collections for the suggestion boxes. Collection ought to be made at least once a week. As soon as a suggestion is received, a note of receipt and thanks should be sent its author. This note may be a filled-in form, but many suggestion departments prefer to have it appear on the firm's letterhead as a typed letter. Where suggestions are not signed, but are marked with serial numbers, a list of the numbers received for each period may be posted on the bulletin board or announced through the house magazine.

It is a mistake to allow suggestions to pile up in over-large proportions. Committee meetings should be held frequently enough to keep abreast of the collections. Where suggestions are referred to department heads or other experts for preliminary investigation



Prominent in High Places

The excellence and sturdiness of character that ensure prominence in high places are found in Caldwell Cypress Tanks.

Selected cypress from our own trees and sawmills, carefully dressed and fitted by our own workmen skilled in thirty years of building "The Tank With a Reputation," is a combination that affords the utmost of water-tightness and weather-resistance.

Send for Catalog

W. E. Caldwell Co.
Incorporated
200 Brook St. Louisville, Ky.

Caldwell TANKS AND TOWERS

For Your Own Protection Learn How to Tell Genuine

Linoleum

Look for the woven *Burlap* Back

BURLAP is a sturdy, *woven* fabric made from the tough fibres of Jute. These tough, woven fibres give to Linoleum its strength and durability.

All genuine Linoleum is built on a strong Burlap back. It will give service, economy and permanent satisfaction in every room in the house.

JUTE INDUSTRIES, LTD.,
320 Broadway New York City

Ask your merchant to show you the woven BURLAP back

Digitized by Google



A 15 Minute Job *for* 7 Men
A 3 Minute Job *for* 2 Cyclones!

IT'S a three minute job for one man to bring these two Cyclone Hoists into position, hook onto this 3200 lb. industrial truck, pick it up and invert it. It formerly required 7 men 15 minutes to perform the same job by hand.

It is easy for you to estimate the tremendous saving in time and cos which these two Cyclone Hoists have accomplished in the two years and a half since installed. An almost unbelievable figure—but true! Cyclones show surprising savings wherever they replace "strong arm" material handling methods.

Capable distributors in all localities. Catalog mailed on request.

The Chisholm-Moore Mfg. Co.
Cleveland, O.

Hoists Cranes Trolleys

Branches: New York, Chicago, Pittsburgh

'C.J.' Coal Meter



—Stops leaks

—Checks Wasteful Firing

—Cuts power costs

—Gives exact record of Coal Consumption

If your boilers are equipped with Jones, Taylor, Westinghouse, Sanford Riley or Detroit Stokers you can easily stop coal wastes by attaching a 'C. J.' Coal Meter to the stoker shaft.

The original cost is very small and there is no additional maintenance charge.

The 'C. J.' Coal Meter gives you an accurate check on every pound of coal used in the boiler. It shows which boiler is wasting coal and the irregularities in operation which lead to coal waste.

Send for one and try it. Sent on 30 days' trial. Write for illustrated literature and prices.

'C.J.' Manufacturing Company
3401 N. 5th. Street
PHILADELPHIA PENN.

and report, the reference should be made promptly by the suggestion department manager or secretary as fast as received. Of course some suggestions will require longer time than others: some can be disposed of quickly by the committee, others may require reference to several authorities before final decision is made; hard and fast scheduling is not always possible, but the suggestion secretary should never permit any stagnation in his department.

Fairness is the prerequisite of a successful suggestion system. It can be safeguarded to a large extent by having a competent and representative committee to pass on all suggestions. But the quality must apply not only to the judgment of the committee in making its decisions and awards, but also to the routine of the department to pass on all suggestions. There must be a scrupulous regard for accuracy in all clerical operations. For example, it sometimes occurs that two or more people will make a suggestion that is essentially the same idea. The usual practice is to credit the suggester whose idea reaches the department first. The simple operation of time-stamping each suggestion as soon as received thus assumes an importance far beyond that of ordinary clerical routine. And so with all other records of suggestions. Not only are they important in facilitating the departmental work, but in many plants promotions are made on the basis of suggestion records (among other things) and accuracy of the records is essential to fairness in rating the employees.

For each suggestion received the following records are usually necessary: name, date, number of the suggestion, subject, to whom assigned for investigation and report, final decision, nature of award, results.

It is usual in many plants to number each suggestion as it is received, copy it without the author's name, file the original, and send the copy to the committee. This practice is an aid to fairness, for it insures that any prejudice against or favoritism for a suggester will not figure in the judgment on his idea. This is quite an important point, and is emphasized by many suggestion systematizers. The suggestion department regulations of one large factory in Chicago contain this clause: "In no case shall the name of the author of the suggestion be disclosed to the Suggestion Committee until after the award, if any, has been made and approved by the superintendent. If it is necessary for the Suggestion Committee to have more information than is shown on the suggestion form submitted by the employee, the secretary or someone qualified shall be appointed to interview the suggester and report back to the Committee."

Where the original suggestion is not signed, but numbered, the identity of the author is obviously unknown; but even here many suggestion departments find it desirable to make a copy of the original. It safeguards against loss where there is much handling, and moreover makes sure that the Committee gets a legible copy.

The employer who assumes that his employees are duty bound to suggest economies, originate improvements, and pass on to him other ideas for the betterment of his business, will not get very far with a suggestion system. The average employee has no such notion. The foremen, the department heads, and other executives are expected to make improvements, but they are in a different class from the rank and file. The worker at the machine, or on the bench, or in the yard, is employed to do the job laid out for him. Thinking up improvements is beyond his line of duty. It is extra work, and must be recognized as such—and rewarded as such. Otherwise there won't be much constructive thinking at the machine, on the bench, or in the yard.

This means that suggestions must receive some special reward. There must be some special incentive to the workers to think up suggestions. Without the incentive, high-sounding announcements and rainbow-colored posters and all the other publicity devices will soon prove to be only so much "hot air."

Most companies give cash awards to the authors of acceptable suggestions, but this

(Continued on page 44

Digitized by Google



Unloading

Without		With
50 tons	**Quantity**	50 tons
5	**Men**	2
9 hrs	**Time**	3 hrs.
35c	**Hourly Wages**	35c
$15.75	**Unloading Cost**	$2.10
31½c	**Cost Per Ton**	4.2c
	Save Per Ton	27.3c

(Figures courtesy A. J. Oburt, The Ochs & Frey Co., Allentown, Pa.)

For Unloading, Storing and Reclaiming Your Coal Supply



Storing

Without		With
3000 tons	**Quantity**	3000 tons
30	**Men**	4
85 hrs	**Time**	85 hrs.
40c	**Hourly Wages**	40c
$1020	**Storing Cost**	$137
34c	**Cost Per Ton**	4.5c
	Save Per Ton	29.5c

(Figures courtesy of Mr. Hazelrigg, Atlantic Coast Elec. R. R. Co. Asbury Park, N. J.)

ask any user

AN enormous saving in time and labor will follow the handling of your coal supply with the Scoop Conveyor.

These are typical cases. Thousands of others just as convincingly prove the necessity for the Scoop Conveyor in every plant.

With this efficient self-contained portable conveyor on hand any open space adjacent to your plant becomes an ideal site for storing coal—without further investment.

Be ready to store your coal supply—and safeguard yourself against an unexpected shortage in case of strikes, floods, storms or other exigencies beyond your control.

Let us submit practical suggestions that will save money for you. Write for Bulletin No. 63.

Portable Machinery Co.
PASSAIC, N. J.

THE SCOOP CONVEYOR

Digitized by Google

POWELL VALVES

Backed by 75 Years Experience

Powell Triple Acting Valves automatically close when a tube bursts —isolating the boiler.

POWELL WHITE STAR VALVES

are a combination of the most serviceable mechanical factors insuring to the user unfailing dependability.

Two reasons for their long life are their regrindable, renewable disc, both cast of Non-Corrosive Powellium Nickel.

Medium and extra heavy for steam working pressure up to 200 and 300 pounds.

SEND FOR DESCRIPTIVE CIRCULAR

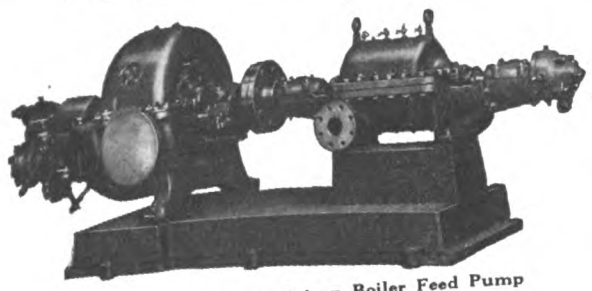
Fig. 2228



The Wm. Powell Co.

2525 SPRING GROVE AVENUE CINCINNATI, OHIO

MORRiS PUMPS



Centrifugal Turbine Driven Boiler Feed Pump

Reliable and Efficient for Boiler Feed —for Fire Protection

Since 1864 Builders of Dredges, Centrifugal Pumps amd Steam Engines

Morris Centrifugal Pumps are rapidly displacing reciprocating pumps for boiler feed. Moreover, many installations are being equipped with these pumps for fire protection. They are built in various stages, usually direct connected to steam turbine or motor. In the 2" and 4" sizes, an especially constructed opposed impeller type is used. A standard multi-stage type is available in the larger sizes.

The Morris Centrifugal Fire Pumps are made in capacities of 500, 750, 1,000, and 1,500 gallons per minute.

Let us help you solve your pumping problems.

MORRIS MACHINE WORKS

200 Genesee St., Baldwinsville NEW YORK

(Continued from page 42)

practice is not universal. Some claim that gift articles—a watch, a micrometer, a fountain pen, a pipe, a work-cap—are more appreciated than their equivalent in cash. Of course such awards cannot be made arbitrary—you might find a pipe going to a non-smoker, or a fountain pen being awarded to a man who already possesses two fountain pens. The usual plan here is to list several articles of approximately equal value and invite the successful suggester to take his choice. Different grades of articles are provided for the different grades of suggestions.

Some other companies reward suggestions on a merit basis entirely. The author of an accepted suggestion receives an engraved certificate and perhaps a medal. He may also receive a letter from the president or some other executive acknowledging his service to the company. A suggestion system operated on this plan is usually an important factor in rating men for promotion; when a vacant foremanship is to be filled, the suggestion records are studied closely and play a part in the selection. Such suggestion systems have proven successful in several instances. The extra pat on the back and the assurance that the company is aware of the man's extra effort and has recorded it, serve as a reward and keep the men mentally alert for new ideas to suggest.

By far the greater number of suggestion systems provide cash awards. Some combine the cash award with other features. One large concern, for example, gives each successful suggester an award of money, a certificate, and a bronze medal. In another case, educational trips are given. The author of the best suggestion for the period may take a trip to New York with several days spent in the metropolis, all expenses paid by the company.

In some cases there is a flat amount awarded for all acceptable suggestions. Thus one company gives $5 for every idea that wins the approval of the committee. The usual practice, however, is to fix the amount of the award in some ratio to the value of the suggestion. One company has devised this schedule of awards:

$2.50 each for suggestions which are neither original nor have any appreciable money value yet which shoud be adopted, perhaps with modifications.

$5.00 each for suggestions which are not original but have appreciable money value.

$10 each for suggestions which are not original but have considerable money value.

$10 each for suggestions which are original but have no appreciable money value.

$50 each for suggestions which are original and have considerable money value.

$50 or more for particularly valuable suggestions. (Awards in excess of $50 must be approved by the manager.)

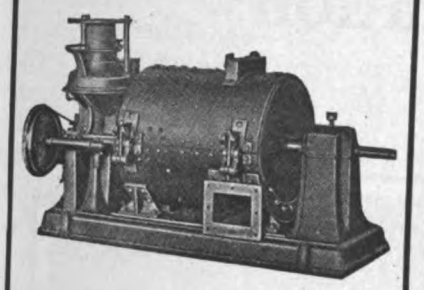
$5 additional award to any employee who submits five acceptable suggestions.

The suggestion manager of a large Eastern factory said that his practice does not favor standardization of awards; but very careful scrutiny is made of each suggestion which gives promise of being acceptable; it is rated individually, and an award is made in proportion to its savings. The savings are determined through the cost department's careful figuring. This company has put its suggestion department on a practical basis of what it will save the company through improvements and economies, and gives less attention to the inspirational features than many others do. The proportion of suggestions accepted is perhaps lower than that in most plants. Awards are generally not given until the suggestions have been put into operation and have been proved practicable. Where the value of the suggestion is not measurable in savings calculable by the cost department, and is yet sufficient to warrant its adoption, the committee itself makes an estimate and fixes the award accordingly.

It is obvious that an extraordinary suggestion ought to obtain an extraordinary reward, and most companies that have successful systems in operation do not hesitate to make an exception from their fixed schedules or ratings whenever a very valuable idea is presented by an employee. In a large Eastern shoe factory not long ago one of the workers was awarded $5,000 for an idea. Of course the $5,000-suggestion comes along only once in a blue moon; most of the suggestions received at this plant draw $10 or less, and as far as their intrinsic value is concerned are probably overpaid at that. But when the big idea is offered, it ought to get

Digitized by Google

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway
New York

an appropriate recompense.

Sometimes a suggestion will result in a patentable device. An important Massachusetts company which manufactures paper and paper products covers this question for its suggestion system in this provision: If a patent is secured as the result of a suggestion, the company will assume all the expense of obtaining the patent and will award an additional prize of $100 to the suggester on the assignment of the patent to the company. Should the patent prove to be of exceptional value, an additional award will be made in proportion.

An interesting system of awards has been devised by another New England factory where the crop of suggestions averages close to 300 a month. Its schedule is as follows:

> For his first accepted suggestion, the suggester receives $3 and a framed certificate signed by the president and vice-president of the company.
>
> For his second accepted suggestion, he is awarded a framed picture of the factory (or, as an alternative, he may choose a framed picture of the home of the founder of the business). Attached to the picture is a metal plate engraved with the name of the suggester and the date of the award. Dates are added to this plate as additional suggestions are accepted.
>
> For his fifth acceptance, a special award of $10 is given.
>
> For his tenth, and every subsequent ten suggestions, the award is $25.
>
> For his eleventh accepted suggestion, the suggester receives the remaining of the two pictures from which he made his choice for his second award, and the new nameplate is engraved with dates for subsequent suggestions in the same manner as the first plate.

In addition to the above awards, extra awards are made by the company for suggestions having tangible commercial value. These awards vary, according to the value of the suggestion, from $5 to $50—though there is no fixed maximum.

To give a competitive character to the campaign for suggestions and stimulate further interest, a special prize of $25 is given at the end of July and December each year to the employee who has submitted the greatest number of accepted suggestions during the preceding six months.

The idea of a prize contest is used by several companies in combination with the plan of individual awards for all suggestions accepted. Thus one company which gives a flat

(*Continued on page 47*)

COST Accounting

Only School in U. S. Specializing in Cost



"Opportunity" knocks but once.

So don't let this opportunity pass to investigate the J. Lee Nicholson Institute of Cost Accounting, the best school of its kind in existence.

Nicholson trained cost accountants are big valuable men of large incomes. They fill big positions because they know exactly what to do and how to do it. And here is a profession where the demand is greater than the supply.

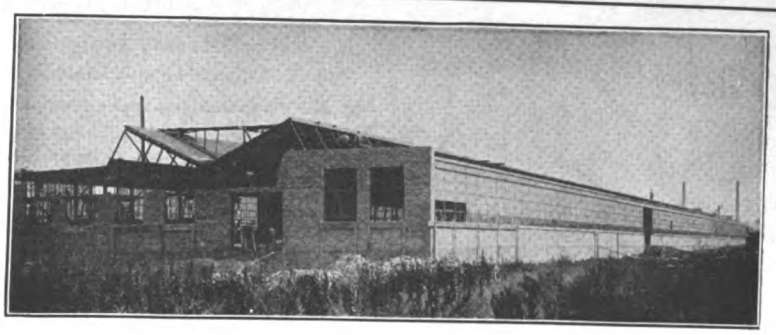
Consultation Free

Send for Booklet

J. Lee Nicholson Institute

Dept. G

6 North Michigan Ave., Chicago, Illinois.



Construction Costs Have Reached the Bottom!

THE cost of building factory structures is at the lowest point since 1913. The increase in demand for additional manufacturing space which is already following the resumption of activities in many lines will soon produce an increase in building costs. Those who need factory space but have waited for the lowest point in building costs can profit by building during 1922.

Thirty Years MRBN of Industrial Buildings

An additional saving can be made by employing "MRBN" Engineers to plan the building for you. Write for one of the members of our firm to come and outline to you our method of handling the design of industrial buildings at minimum cost to you.

Build Now!

MILLS · RHINES · BELLMAN & NORDHOFF

Engineers

TOLEDO · OHIO

Digitized by Google

COWAN

Concrete Facts on Electric Lift Truck Economies in Industrial Transportation

TWENTY-TWO men eliminated, with a saving of $66 per day, $19,800 a year, by one Cowan Electric Lift Truck in the plant of a prominent Pennsylvania manufacturer (name omitted by request). This is the saving in wages alone and does not include the many other savings effected through quicker delivery and increased turnover.

$9720 a year in wages saved, in the Geo. W. Prentiss & Company Wire Works, Holyoke, Mass., where one Cowan Electric Lift Truck has replaced eight men.

$1200 a year saved in wages and many other economies effected by one Cowan in the plant of the Brown-Lipe-Chapin Co., Syracuse, N. Y.

Of the many typical instances which prove the manifold economies of Cowan Electric Lift Trucks, these are but a few. In foundry, machine shop, manufacturing plant, and warehouse, handling a wide variety of goods and materials, Cowan Trucks have demonstrated beyond question their ability to reduce manufacturing and handling costs.

The Cowan Truck and Skid System for material handling is complete in every detail. It includes Cowan Electric Lift Trucks, Hand Lift Trucks, Electric Load Carrying Trucks, Electric Tractors, and Skids—applied individually or in combination, depending upon the requirements of each particular situation.

Cowan representatives are material handling experts. They will gladly study your particular problem and explain how you, too, can profit through the worth while economies of the Cowan system. This service or Cowan Bulletins promptly furnished at your request.

COWAN TRUCK COMPANY

6 Water Street, Holyoke, Mass.

N. Y. Office: Grand Central Palace

Representatives in Principal Cities.

Largest Manufacturer of Complete Hand and Electric Industrial Truck Systems





Handling boxed and packaged goods at the American Warehouse Company, Galveston, Texas. These heavy loads are handled by one man and a Cowan Truck.



One man and a Cowan easily pick up heavy loads of wire at the George W. Prentiss & Company Plant. Note ingenious skid rack.



At the Brown-Lipe-Chapin Plant the Cowan Electric Lift Truck handles boxes, barrels, castings, production matrials, and misellaneous stock room supplies.

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators of the "through ticket" *system for* moving loads

Digitized by Google

(*Continued from page 45*)

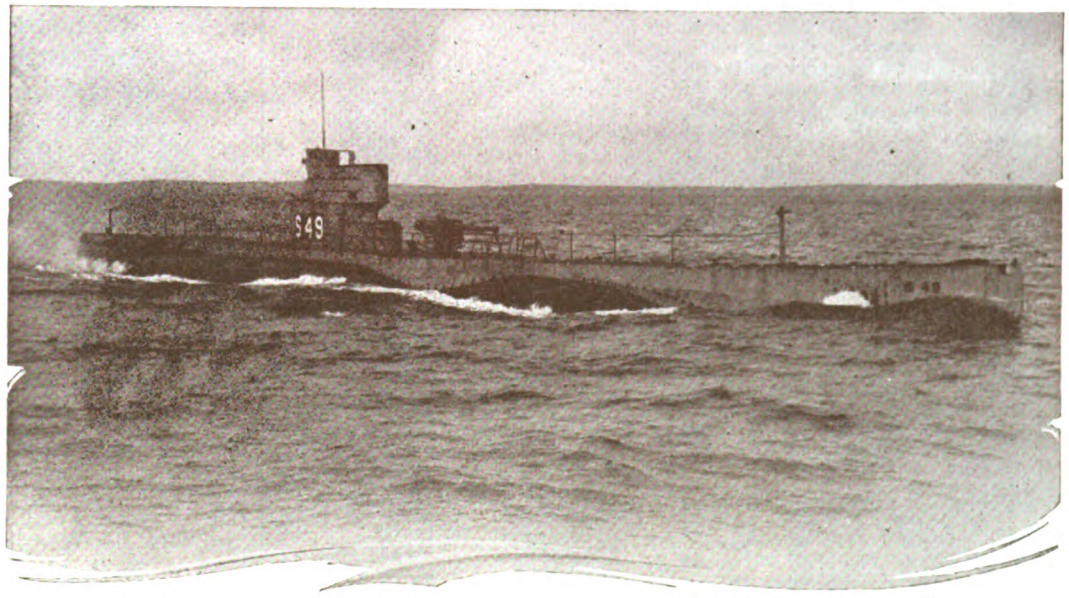
$5 award for all acceptances, also awards at the end of each year $100 for the best suggestion of the preceding twelve months, $50 for the second best, and $25 for the third best.

Where the suggestion system is conducted on a contest basis, different results have been reported. The manager of a system which now makes individual awards for each suggestion accepted, reports that his system used to be on a monthly contest basis and was not so successful then. "We started out, the first year, with an offer of $50 every month for the best suggestion submitted during the month and $100 at the end of the year for the best suggestion of the year. This method did not work for the reason that in some months no suggestion received was worth $50. The next year we changed this and announced that we would award $50 in prizes each three months. One difficulty here was the long period in between awards, during which many employees lost interest. Our present practice is to make awards every month, and to give something for every idea accepted."

The contest idea cannot be discarded, however, for one of the oldest and most successful suggestion systems in the country is run on this basis. It runs two contests a year of six months each, one ending June 30th and the other December 31st. The competition is therefore practically continuous. Interest is kept up by frequent posters and announcements, and by the offer of a large number of prizes. Where only a few prizes are offered, many employees, aware of their own inferiority to a few star "suggesters," will give the prospect up as hopeless. But where several hundred prizes are offered, as is the case in this factory, there is incentive for everybody to compete. In a recent competition $8,000 in prize money was offered for the six months' contest; the prizes ranged from a first prize of $150 cash and a ten-day educational trip costing $200, a total first prize valuation of $350, down to hundreds of $5 to $1 prizes. And there were numerous prizes in between these extremes. For example, there were ten prizes of $35 each, fifteen of $25, twenty of $20, forty of $15, and one hundred of $10. The amount of prize money varies from contest to contest, but it is always sufficient to offer an incentive to thousands of employees. Moreover, the record of the suggestion department in this plant for the last twenty-eight years is well-known among the employees, and serves as an additional stimulus. They know that during that time many thousands of dollars have been distributed for suggestions. The new employee quickly gets into the swing of this tradition.

An important factor in the success of this company's suggestion system is the character of the publicity campaign carried on by the suggestion department, and the policy of recognizing the successful suggesters not only by awards of money but by public ac-

SKF



Ball Bearings Guard the Safety
of Submarines While Submerged

THE vital parts upon which the safety of the crew depends when the submarine is submerged are the main motors which drive the vessel and the auxiliary motors that operate the pumps. If these motors fail serious consequences may result.

For this exacting duty where positive performance at all times is the paramount requisite, motors equipped with SKF marked self-aligning ball bearings are used.

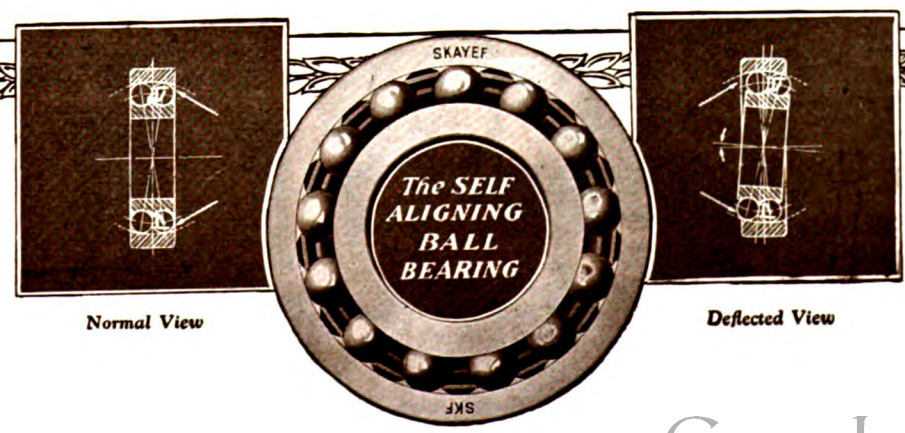
As this type of bearing shows no appreciable wear, the most common cause of motor failure—burnouts due to bearing wear—is prevented. Oil cannot escape from the bearings when the vessel rolls or when it submerges or emerges at steep angles, neither can water enter the housings and play havoc with the bearings.

Wherever performance is the first consideration, whether it be on submarine motors, propeller shafts or in the common machines of industry, self-aligning ball bearings will be found.

THE SKAYEF BALL BEARING COMPANY

Supervised by SKF INDUSTRIES, INC., 165 Broadway, New York City

804



Normal View

Deflected View

BALL BEARINGS

The Highest Expression of the Bearing Principle

Digitized by Google

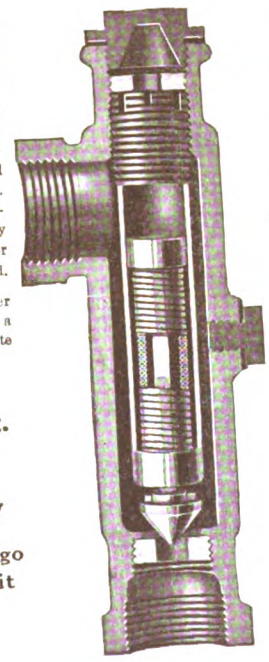
Economy Says: "Put a Steam Trap Wherever One is Needed"

The high cost of ordinary steam traps is responsible for an annual steam loss aggregating hundreds of thousands of dollars. When traps run into big money you buy fewer of them and leave untrapped many points that should be protected. Valuable heat units are thus wasted.

Give your steam lines a sufficient number of traps to take care of the condensate as it forms and you will save money. The solution lies in the moderate-priced Steam Trap Sarco.

The price you pay for a single trap of the "bucket" or "float" type buys three Sarcos. Because of its small size and simple mechanism, the Sarco can be manufactured at low cost and sold at a corresponding figure.

Think what it would mean to be able to drain your lines at many points, or to drain individual heating units, instead of using one or two traps on the entire line!



And besides saving money for you in this way the Sarco also saves in maintenance cost and installation expense. Having but one moving part, the Sarco doesn't get out of order, doesn't require expensive repairs, doesn't balk and interfere with production. And it can be placed anywhere in the line, at any angle. No pit digging or platform building required.

Our 30-day free trial offer enables you to give the Sarco a tryout at our expense. Write today for Booklet R-22.

SARCO CO., Inc.

236 Broadway
New York City

Buffalo Chicago
Cleveland Detroit
Philadelphia

Steam trap SARCO

knowledgment of them by the executives. Usually, at the end of every six months contest, there is a banquet tendered by the company to the suggesters; sometimes the celebration takes the form of a field day and picnic in the country. Always at the close of the campaign and the award of prizes is marked by some public gathering of the suggesters and a message to them from company executives.

The final "must" of a successful suggestion system is the requirement that those who administer the system have some understanding of human nature. It is not enough that the system be well organized, it is not enough that it be prompt and fair in its handling of details and in its awards, it is not enough that it stand willing to help those who want help. It has to go the "second mile" in its attention to and service for suggesters. Tact, diplomacy, understanding, sympathy, friendliness, patience—these are some of the personal qualities required.

Take the matter of turning down a suggestion. Of course it is easy to handle the successful suggesters; occasionally one who is exceptionally opinionated with respect to his own abilities may feel that he ought to win first prize when he gets only second, or that he should have received a larger award in some other respect; but most employees whose suggestions are accepted are proud and happy and well satisfied with the results. These are only a minority of the suggesters, however; in many plants, only about ten or fifteen per cent of the ideas offered are of any value.

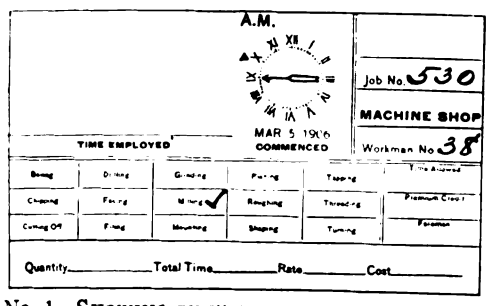
But the rejected idea may be of value to the man who offered it. Usually it is something he's pretty proud of. Maybe it's a pet idea he's been nursing for months, just waiting to get it in shape to spring. It may be the result of considerable thinking about his job. In most cases, he believes in his idea. Then he sees the list of accepted suggestion posted on the bulletin board or maybe printed in the plant magazine. His suggestion is not in the list. Of course he is disappointed.

It is quite important to break the news of his failure very tactfully to this man. Some companies have the letter of notification signed by one of the higher executives, and of course the letter is carefully phrased to carry a friendly tone and encourage the employee to try again. Some companies will not trust to a letter, but invite the suggester to call, and the matter is explained to him in a personal interview. These interviews in some cases have succeeded in pointing the suggester to a new angle of his idea, which, when he worked it over, became practicable and acceptable. In any event, the interview enables the suggestion secretary to come into contact with the man, to "let him down easy," and to encourage him to keep coming with suggestions.

The rule works both ways. Not only must every precaution be taken to keep the good will of the unsuccessful, but every good means must be used to make the most of the successful ones in promoting interest in the suggestion campaign. Featuring the exceptional ideas in bulletins and plant papers, running pictures of the prize-winning suggesters, making an event of the exercises incident to the giving of awards—in these and many other ways valuable publicity can be won for the suggestion system at the same time that honor and credit are being given the suggesters.

An important thing to remember is that one of the most valuable returns from a successful suggestion system is the good will of the employees and their increased interest in the plant and its operations. This return is impossible to secure, in the average plant, by mere justice. There must be in addition the warming quality of human interest. Friendliness, fairness, promptness—do they not sum up the essentials?

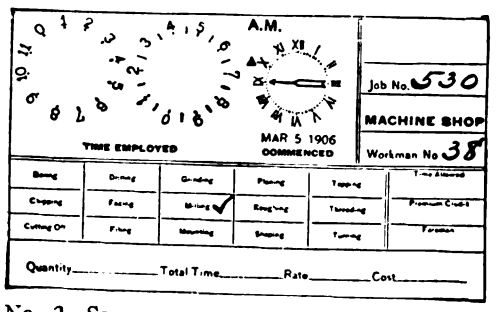
Digitized by Google



No. 1. SHOWING FIRST OPERATION, TIME-OF-DAY

Pushing the right-hand lever away from the operator prints the date and time of day. The arrow in this dial indicates the minutes and the wedge shows the hour.

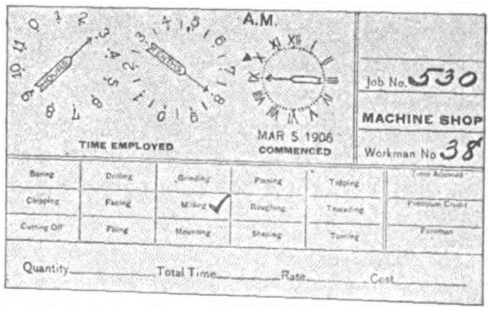




No. 2. SHOWING SECOND OPERATION, ELAPSED TIME DIALS

Pulling the right-hand lever toward the operator prints the dials which form a part of the elapsed-time record. These dials are printed immediately after the time-of-day record is made and before the card is removed.





No. 3. WITH ARROWS SHOWING COMPLETE RECORD.

Pulling the left-hand lever toward the operator prints the arrows completing the elapsed-time record. Both elapsed-time dials revolve with their respective arrows, thus making it possible to obtain the records of any number of employees from one Calculagraph.



Here are the three steps by which the Calculagraph Records "elapsed time"

THE complete record shows that workman No. 38 commenced work at 9:45 A. M. March 5 and that he performed a milling operation on Job No. 530, in two and eight-tenths hours.

The complete record is printed right on the job ticket showing the starting, stopping and *elapsed time*.

If you have never seen the Calculagraph it would be well worth your while to investigate it.

A copy of our booklet, "Elapsed Time Records," will be sent upon request.

THE CALCULAGRAPH

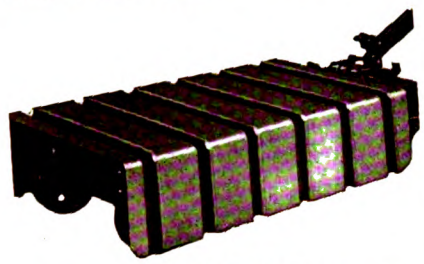
THE ELAPSED TIME RECORDER

34 Church Street, New York City

Digitized by Google

TRUSCON ALLOY PLATFORMS STEEL

Used in connection with Lift Trucks



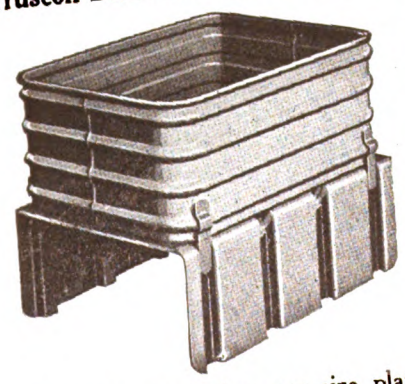
Because of Their Convenience

Every time materials are placed on the floor, money is wasted. To lift and place them costs money, and to set them down costs money. More than half of this constant expense is avoided by using the Truscon Alloy Steel Platform. To place the materials on a platform is even easier than to put them on the floor. Moreover, the hand operations of lifting the materials from the floor and piling them on the truck are altogether eliminated. The platform when loaded is quickly moved along by means of a lift truck.

Because of Their Durability

Any platform will save money in the ways described, but the maximum economy is secured thru the use of the Truscon Alloy Steel Platform. Formed of one piece of heavy gauge pressed steel stiffened by deep ribs, the Truscon Alloy Steel Platform stands up under hard use and saves repair expense. It does not get out of order nor wear down like wood; its clearance height remains uniform and the full width is available for inserting lift truck. Furnished in numerous sizes to meet varied conditions.

Truscon Boxes for Steel Platforms



Skeleton boxes fitting any size platforms are furnished in various depths. They are either welded securely to the platform or equipped with steel stakes which slide into the ribs of the platform. Made of heavy gauge steel, reinforced with deep stiffening ribs and flanged edges. We make boxes to meet every requirement.

Tell Us Your Requirements for Anything in Pressed Steel Parts

Truscon Steel Company

YOUNGSTOWN, OHIO

Sales Offices in Principal Cities

Weighing Materials "On the Move"

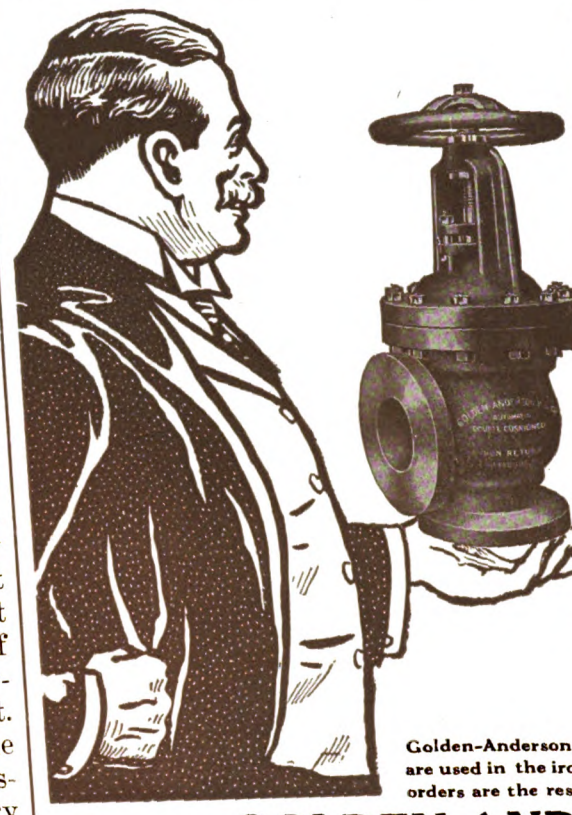
(*Continued from Page 23*)

or and weighed in transit. At hundreds of other plants, this same method is used for billing out material. The Michigan Limestone & Chemical Co., Rogers, Mich., for instance, sell all their stone over conveyors. This plant ships between five and six million tons of stone yearly; the shipping season only lasting approximately eight to nine months. Therefore, it can be readily seen what a difficult matter it would be to obtain the weight of such large quantities of stone if not handled by conveyors and weighed in transit. Here the stone comes from the crushers, is delivered to a system of conveyors, which carry it to bins or outside storage; other conveyors are then used to move the stone to the boats or barges and on each loading conveyor the weight of the stone is mechanically recorded.

In a prominent New England paper mill, not only is the coal weighed as it is received, but during the process of paper manufacture wood chips and sulphite laps are weighed as they are conveyed. Prior to the installation of this method the chips were recorded on a cordage basis, regardless of moisture content and grade of pulp wood, while the laps were weighed by hand with a consequent employment of several weighman.

The ore mining and refining industry uses this same system for checking the ore as it comes from the mines, for the payment of wages to contracting miners, for the payment of royalties to the state, as well as for the determination of concentration and for billing out the concentrates. By having checks hourly or daily, they are assured a steady flow to all departments of the plant. No department therefore is under or overloaded, choked or intermittently run; so that the whole plant operates at a maximum amount of efficiency.

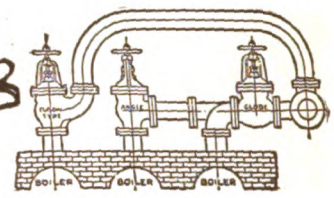
Another adaptation of the principle of weighing in motion is the weighing of cable cars while in motion over a track scale, thus obtaining the weight of the material without stopping the cars. This idea has also been recently



DOUBLE EXTRA HEAVY Valves

"Every Valve Sold With a Positive "Guarantee." "Hosts of References."

"The Heaviest Valve Made"



4100

Golden-Anderson Life and Property Insurance Valves are used in the iron and steel industry. Their repeat orders are the result of assured protection.

GOLDEN-ANDERSON

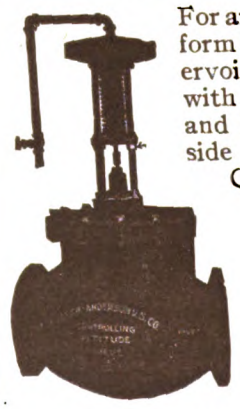
"Life and Property Insurance Valves"

Patent Automatic Double-Cushioned Triple-Acting and Non-Return Valves

1. They will automatically cut a damaged boiler out of service—making it impossible for live steam to pour back into it and cause a disastrous explosion. The other boilers are left intact, and can be continued in operation.
2. They will automatically shut off the steam flow from all boilers the moment that a pipe ruptures, thereby eliminating a pipe explosion.
3. A fresh boiler is automatically cut into the line, eliminating the serious danger involved when doing this by hand.
4. The pressure is automatically equalized between all boilers.
5. No steam can be turned into a cold water boiler, thus protecting men working inside.
6. Fitted with double Corliss dashpot which insures perfect cushioning in opening and closing.
7. No pounding, sticking or spinning.
8. The only valves that can be tested in service.

Golden-Anderson

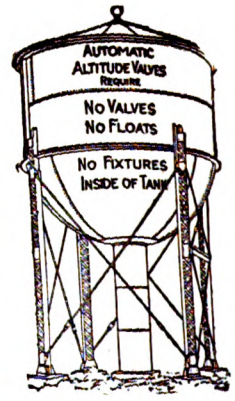
Automatic Cushioned Controlling Altitude Valves



For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. Three Ways of Closing "These Valves."

1st—Automatically by Water.
2nd—By Electricity, if desired.
3rd—By Hand

May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.



GOLDEN ANDERSON

Patent Automatic Double Cushioned Check Valve

1. Perfectly control the reverse flow of water in case pump stops to eliminate water hammer or shock.
2. Can be adjusted to operate either quickly or slowly.
3. Especially adopted for irrigation systems, water works, etc., having disastrous reverse flow of pressures.
4. Perfect cushioning obtained by water in opening and closing.

Sizes to 30" Angle or Globe Pattern.

Especially adapted for Hydraulic Elevator Service



Golden-Anderson Valve Specialty Co.

1306 Fulton Building Pittsburgh, Pa.

Digitized by Google

adapted to the weighing of grab buckets of coal as they are drawn from the storage pile. This system is installed at the plant of the New York Steam Corporation, New York City. Here are found two monorial hoists or man trolleys, which travel down the boiler room to the coal pile. Upon drawing up a bucket of coal the hoists travel back over the boiler stokers and deposit their load. While the hoists are traveling down the boiler room the coal in the bucket is automatically weighed and its weight recorded on a totalizing counter; the man operating the trolley having nothing whatever to do with the weighing.

To the small user of that best known commodity, coal, check weighing against bills of lading seems an expensive luxury; yet one department store found it saved enough money the first year to pay for the installation many times over. This company during the year was billed for seventy thousand pounds of coal which it did not receive. The weights on the bills had apparently been raised ten thousand pounds per car.

Material Handling in the World's Most Modern Sugar Refinery

(*Continued form Page 14*)

steel and brick, three bays wide, and runs the length of the dock, with a crane in each bay. In storage, the bags are piled 22 to 25 high, to be drawn from when no vessel is unloading.

When sugar is to go directly into the refining process, cranes deposit the bags on cutting tables, where they are opened and the contents dumped into crushers. The function of the crusher is to disintegrate lumps which may have formed while the "raw" sugar lay in bags, under pressure, or exposed to excessive heat or moisture. From the crusher the loose sugar falls into the first of the conveyors shown in accompanying photographs. These are slow-moving machines of the pivoted-bucket type, each bucket carrying approximately 130 pounds of sugar.

The raw sugar conveying system is so designed that loose sugar may be carried (1) directly into the refinery, (2) deposited in a storage bin during the day shift, or (3) drawn off from the storage bin at night, and (4) elevated to the refinery. (During the day, bags are being "cut" continuously, but during the night shift, no bags are handled, and sugar is drawn from the storage bin, located in the Raw Sugar warehouse.)

Coming from either the bag-cutting tables or storage bin, the same conveyors above-mentioned elevate the sugar to the 7th floor (top), for the first step on its journey through the refining process. This is known as the "Wash House", and is, as its name implies, the *laundry* for raw sugar. Immediately after being dumped from the conveyors, the sugar is mixed with water and molasses and is then "washed" in centrifugal machines, and the sugar (now in liquid form) passes down through five floors of the wash house by gravity. Through the "Filter House" and to the "Pan House", successive steps in the process, the liquid sugar flows through pipes, entailing no elevating or conveying equipment other than pumps.

After the liquid sugar, ("liquor", in the sugar man's parlance), has been purified or decolorized by passing through the filtering process, it passes into large copper vessels called "pans" in which it is boiled until crystallization takes place, from the pans being drawn off (by gravity) into open tanks to slightly cool. From these tanks the mass of syrup and sugar crystals passes down through centrifugal machines, where the syrup is spun off. As the process machinery is arranged in this building, the sugar has now passed by gravity from the 7th to the 4th floor, and from this point it must again be conveyed mechanically. At this stage the sugar is in a refined

(*Continued on Page 53*)

BYERS PIPE

GENUINE WROUGHT IRON



1 *Home of R. L. Patrick, Burlington, Vt. Architect, F. L. Austin. Byers pipe used for Plumbing, Heating and Vacuum Cleaner lines.*

2 *Masonic Temple, Chicago. Erected 1889. Byers pipe used for Plumbing and Heating Systems.*

3 *The old London and Liverpool and Globe Fire Insurance Bldg., New York City. Erected 1882. Byers pipe used for Heating System.*

40 Years' Service and Still Like New!

SUCH is the record of six miles of Byers pipe installed in the heating system of the old London and Liverpool and Globe Fire Insurance Bldg., New York City, erected 1882.

Another striking example among many is found in the Masonic Temple, Chicago, erected 1889, in which Byers pipe has for 33 years maintained its original serviceability.

Wherever you travel, equally impressive records of pipe durability can be found in old buildings equipped with the genuine wrought iron pipe—the only kind of pipe ever made by Byers. The Tacoma Building, Chicago, America's first skyscraper; the Iroquois Hotel, Buffalo; the German Insurance Building, Buffalo; Cleveland Arcade and Garfield Building, Cleveland—these are just a few notable examples.

In many of these buildings, plumbing and heating fixtures have been replaced by more modern equipment, but the old pipes have been left undisturbed, being in an excellent state of preservation after 30 to 40 years' service.

And this is a most fortunate circumstance, for cutting into walls, floors and ceilings to replace rusted-out pipes, is an operation entailing staggering expense, loss of rentals, endless confusion, and inconvenience to occupants.

Whether you build a home or a large building, Byers pipe is the most economical pipe to use for Plumbing and Heating. It represents the "happy medium" in *first* cost, and —due to its high rust-resistance—the lowest *ultimate* cost.

NOTE: Black or galvanized pipe of every variety is erroneously called "wrought pipe" or "iron pipe". Byers pipe is made by the old puddling process in use for over a century. The rust-resisting quality of the metal thus obtained has never been approached by products of cheaper modern processes. Byers is the genuine wrought iron. Judge its future by its past.



Genuine wrought iron pipe, from County Jail and Criminal Court Bldg., Chicago, in perfect condition after 44 years' service.



A. M. BYERS COMPANY
PITTSBURGH, PA.
Established 1864

New York Philadelphia Boston
Chicago Cleveland Houston

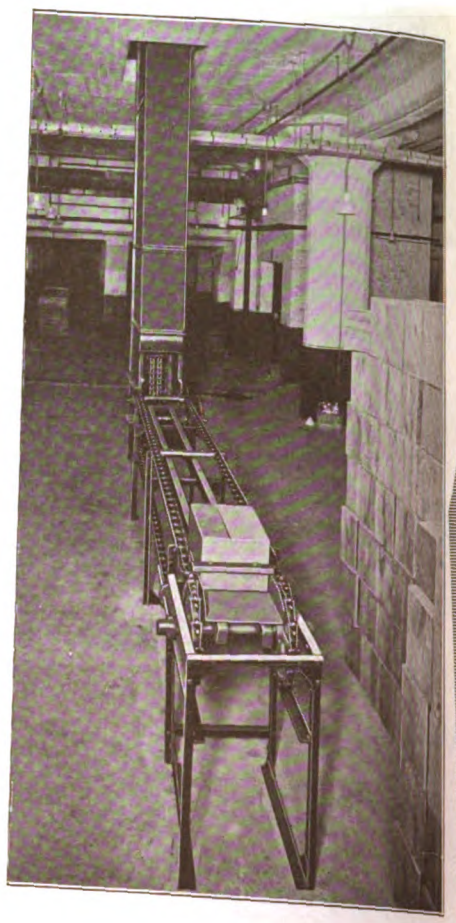
Send for Booklet, "On the trail of Byers Pipe"

Look for the Name and Year rolled in every length

Digitized by Google







Survey Your Plant Through The Eyes of Your Competitors.

SYSTEM immediately becomes the mooted question. True, productive machinery, such as machine shop equipment, mixers, looms, filling machines, etc., is practically standard. The equipment of this class that they have you have. But are you keeping your materials on the move so that all machines are producing constantly. That's the biggest factor of business today. And to keep products in the various stages of manufacture on the move you must use Conveying Systems.

Conveying Systems eliminate manual handling of materials, waste motion, keep operators supplied continuously with work, establish a working pace for employees thereby controlling production and carry finished product to stock room or shipping department. *Just what would a Conveying System mean to your business?* A greater productiou with present payroll which means increased sales and more profits.

Conveying systems to function properly must be designed to meet your requirements. To determine your needs an analysis must be made of your methods of manufacture which involves study of operations, routing of materials, determining maximum production and the securing of necessary data from which a Conveying System which will keep materials on the move in your plant can be designed.

We will gladly have one of our representatives call so that this matter can be discussed to your entire satisfaction.

SAMUEL OLSON & CO.

Loose, Bulk and Packed MATERIAL HANDLING SYSTEMS

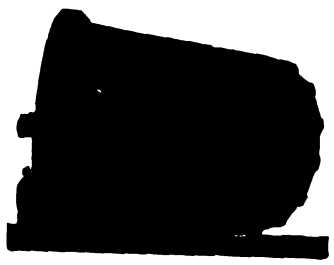
2418-26 Bloomingdale Ave.
CHICAGO, ILLINOIS

5th Ave. Bldg.
NEW YORK, N. Y.

Digitized by Google

PUZZLING Reduction Problems Occur in Almost Every Industry

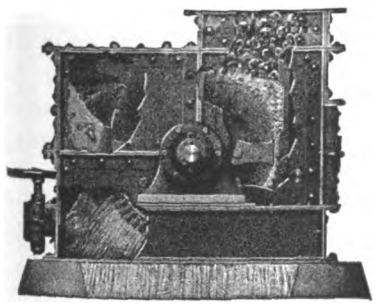
"Pennsylvania" Crushing and Pulverizing equipment has been specialized for crushing and cleaning Bituminous Coal for Power, Gas and Coking purposes, and for the primary, secondary and fine crushing of Cement Rock, Limestone, Gypsum, Ores, Sinters, Chemicals and other Materials of similar structure and hardness.



"Pennsylvania" Patented Bradford Coal Breaker and Cleaner for Coal Mines, By-Product Coke Plants, Central Stations and Gas Works.



"Pennsylvania" Single Roll Crusher for Industrial Power Plants, Gas Works and Coal Mines, in tonnages 10 to 500 tons hourly. (Patented.)



"Pennsylvania" Hammer Crusher for the fine reduction of Limestone, Cement Rock, Oyster Shells, and similar materials. (Patented.)

"Pennsylvania" Crushing and Pulverizing Machinery is distinguished by powerful steel construction, liberal proportions and thorough tramp iron protection, and is specialized for continuously delivering the specified quantity and quality of product in each class of service attempted.

Put your knotty reduction problems up to us.

PENNSYLVANIA CRUSHER COMPANY

Stephen Girard Building, PHILADELPHIA
NEW YORK · PITTSBURGH

(*Continued from Page 51*

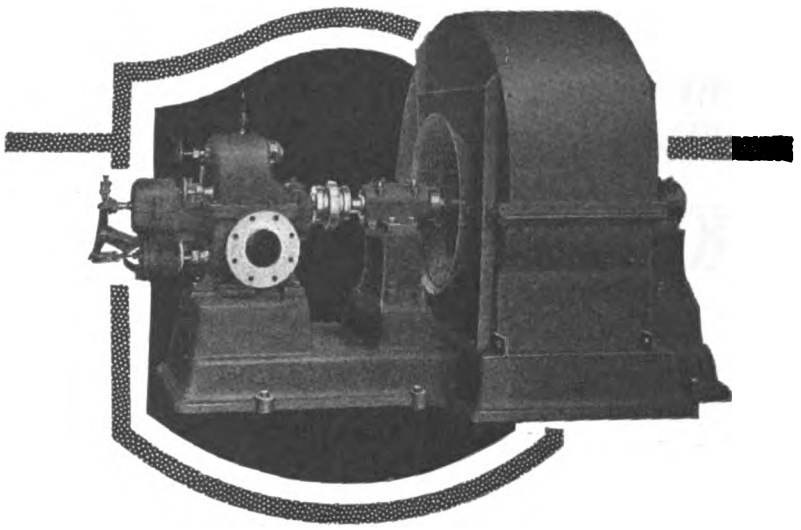
state and pure white, and must be handled so as to be kept perfectly clean.

Continuous conveyors, with buckets of solid cast aluminum, carry the sugar from below the centrifugal floor to the roof of the finishing department, an elevation of approximately one hundred feet. The finishing process involves complete drying and cooling, and screening for the various sizes required for domestic and wholesole trade. Through this part of the "finishing touches" sugar travels by gravity from the roof down through six floors of the building, to a maple lined storage bin, stopping at the 3rd floor. From this storage it drops into either bag-filling or barrel-filling and weighting machines, for bulk shipments, or may be conveyed to the small-package (cartons and cotton bags) filling department. For the latter purpose, the most unique conveyor has been designed and installed. It is also of the continuous type, with solid aluminum, pivoted buckets, each bucket holding approximately sixty pounds of refined granulated sugar, filled by means of a special loading device which permits the sugar to fall into the center of the bucket. Thus the loading is made mechanically uniform, no sugar is spilled, and no sugar comes in contact with any other part of the conveyor than the aluminum bucket itself. The conveyor traverses a horizontal length of 225 feet and elevates 106 feet, changing direction six times, (to conform with the building), but the sugar does not change its position in the bucket during this 6½ minute trip—thereby retaining its original finished lustre and sparkle, and at the same time being absolutely free from dust.

Finer grades, and the so-called "powdered" sugars are processed by gravity, much the same as wheat passes down through a flour mill, and require little or no conveying machinery other than feeders.

In the "filter house," where the sugar liquors are decolorized there are four elevating-conveying units of unusual interest. As previously mentioned, the filtering medium is bone charcoal or "bone-char," which is used and reburned be-

for Forced or Induced Draft



IN the selection of draft equipment it should be recalled that the most essential characteristic of the driveing element is adaptability to speed regulation. When regulation is obtained by throttling the air from the fan there is a loss in efficiency which cannot be recovered. Regulation which varies the speed of the driving unit to compensate for the variety in draft requirements avoids throttling and permits higher overall efficiency. The Terry turbine has the utmost flexibility; in other words, its speed may be regulated to meet the exact requirements of the blower. When used in conjunction with mechanical stokers this speed regulating may be done automatically so that the best combustion efficiency is constantly maintained. Of the 8000 or more Terry turbines now in operation, 1800 of them are used for driving blower equipment. This is why designing and operating engineers say that because of such broad experience you cannot go wrong if for your forced or induced draft service you

Specify

THE TERRY TURBINE

T-773

Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries



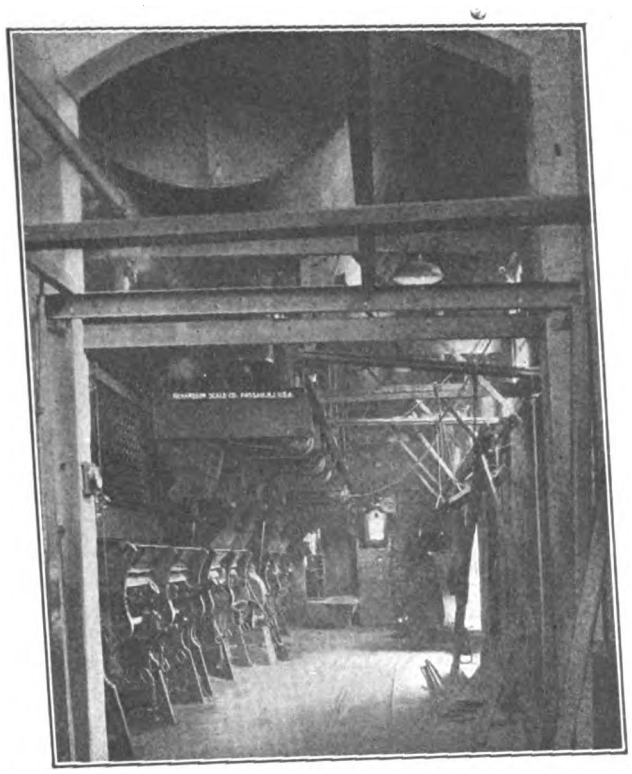
The Terry Steam Turbine Co.
Terry Sq. Hartford, Conn. U.S.A.

Digitized by Google

A Watch Dog In The Boiler Room

Power Losses are Always Heavier When Coal Prices Are Soaring

Keep Tab On Your Consumption



Use A Richardson Automatic Coal Scale To Check Your Boilers

Scale receives the coal from overhead bunker, weighs it automatically and delivers it in a steady, even stream to stokers.

Fires kept steadily supplied. Scale counts and records every draft and tells you which boiler is using the most coal.

A small length, wide, slow speed conveyor belt (part of the machine) feeds the coal to the scale hopper. No restricted openings to choke up. Weighs predetermined drafts. Accuracy guaranteed.

Free illustrated catalogue on request.

RICHARDSON SCALE COMPANY

Passaic, New Jersey

New York Boston Buffalo Chicago San Francisco

tween four and five hundred times. After about 48 hours' service in filtering liquor, the bone-char is washed with boiling water, dropped by gravity into kilns below, re-burned, and dropped again into coolers and hoppers, ready to be elevated to the tops of the filter tanks for a fresh charge. It will readily be seen that char-handling is continuous, and the conveyors in this building run incessantly, being stopped once a week, only, for oiling. They travel absolutely without noise, form no dust while the char is in transit, and reduce the temperatue of the newly-burned char from 140° to 120° enroute, their length being 90 feet and the lift 110 feet. That these elevating conveyors occupy a minimum of floor space, may be seen by the "close quarters" shown in the accompanying illustrations.

Generally speaking, conveyors of the type used in this refinery, perform the greatest amount of work with the lowest possible up-keep cost, smallest current consumption, fewer and smaller motors, and a minimum amount of spillage —practically nil. They convey their contents noiselessly, without grinding or dust, an accomplishment hitherto impossible with types of conveyors formerly and ordinarily used in plants of this nature. The "sweeping gang" needs to be only as numerous as the police force of Iceland, and at the same time the entire refinery is as clean as a kitchen in Spotless Town! Thus is an unappetizing product of the soil converted into pure white crystal food, and packed, untouched by human hands, into sealed packages to satisfy the most fastidious American housewife.

American Development of the Diesel Engine

(*Continued from Page 11*)

most familiarly known in the automobile today. They owe much of their design to the early gas engine experiments; as a matter of fact, both gasolene and kerosene engines are essentially gas engines—making their own gas from volatile oils.

In connection with the Diesel engine, again, another popular misapprehension prevails. The Diesel was not conceived as an attempt to utilize the heavier oils that could not be used in existing engines, nor was it an attempt to better the performance of other oil engines. As a matter of fact, Doctor Diesel's original design provided for the use of powdered coal as a fuel. The radical departure from existing engines, lay in his plan to compress air to a point where its temperature would be high enough to ignite the fuel; then to admit fuel to the cylinder over a period of about 10 per cent of the piston stroke, so that the heat of combustion would replace the heat lost in driving the piston—attaining what is known as the constant temperature cycle.

The first Diesel engine constructed was made to start with an explosive charge in the cylinder, in order to give the initial impulse. This engine turned over just once, being completely wrecked in the process; an event which considerably dampened the enthusiasm of Doctor Diesel's adherents.

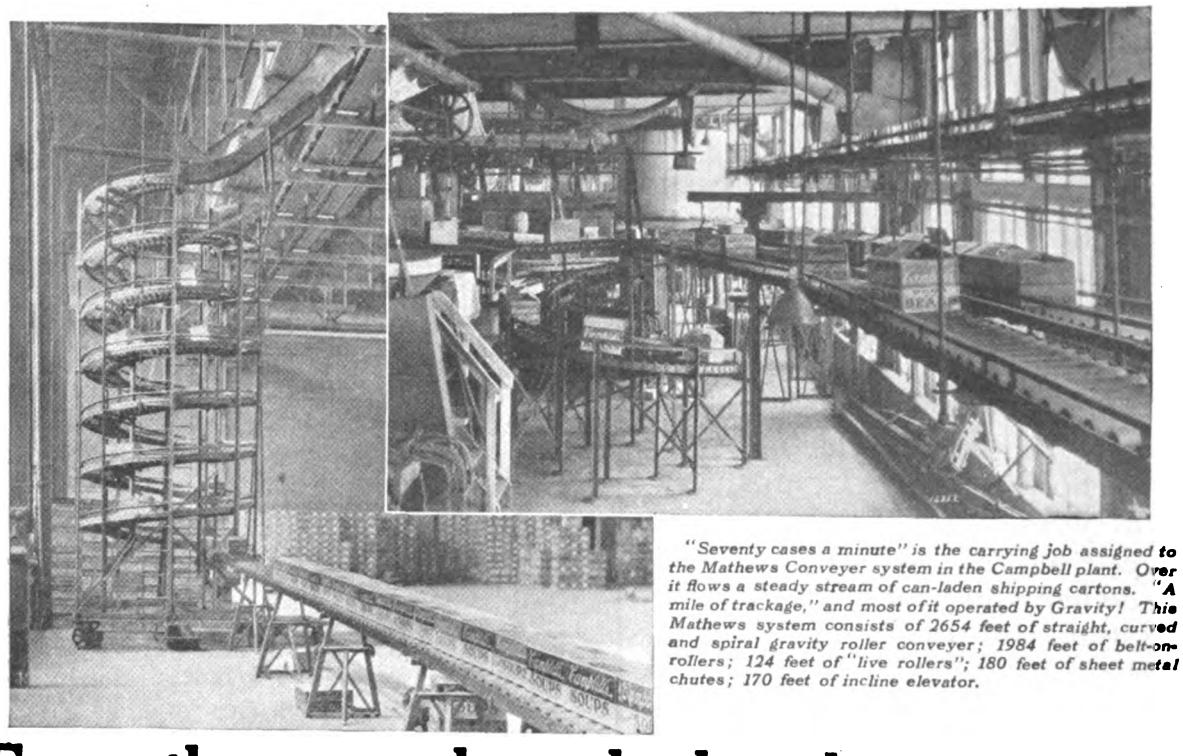
The designers then (in 1893) built a water-cooled engine in which the admission of heat was at constant pressure, instead of at constant temperature, and this engine operated, but generated no appreciable power in excess of that required to keep it going. Development proceeded slowly, and finally, in 1897, a commercially practical engine of 25 H. P. was produced.

It is interesting to note, among the illustrations accompanying this article, the fact that a Diesel engine of 2,000 H. P. has recently been put into service in this country, while in Europe they are al-

(*Continued on Page 56*)

Digitized by Google

Parts of the Mathews Conveyer system in the Joseph Campbell Company plant at Camden, N. J.



"Seventy cases a minute" is the carrying job assigned to the Mathews Conveyer system in the Campbell plant. Over it flows a steady stream of can-laden shipping cartons. "A mile of trackage," and most of it operated by Gravity! This Mathews system consists of 2654 feet of straight, curved and spiral gravity roller conveyer; 1984 feet of belt-on-rollers; 124 feet of "live rollers"; 180 feet of sheet metal chutes; 170 feet of incline elevator.

From the cars, through the plant, and back again—via Gravity

THE Joseph Campbell Company is "some tomato" in the canning field. To keep the millions of cases of "empties" coming from the cars, to keep them moving through the plant, to keep them going back, filled, to the cars, is no small problem in production routing and manufacturing efficiency.

For here time counts! A minute's delay, a slight interruption, the least congestion along the line of supply, operation and outlet, means many idle hands; multiplied labor loss; a deep cut into the day's margin of profit.

Today's supply of labor is far too precious—and uncertain!—its cost too great, to be consumed in such non-productive details as carrying or wheeling materials from operation to operation, moving goods to and from warehouse, loading and unloading cars, etc.

Use Gravity! It's free! Harness it! There's work—a job, a place, an operation, a detail—about *your* plant, be it large or small, where Gravity can be used and time, labor and money saved.

Mathews Gravity Conveyer systems can be fitted, section by section, portably or permanently, to any industry, plant, yard or production route. Mathews drawn-steel, ball-bearing rollers are so perfectly balanced and responsive to Gravity that most anything, from fragile objects to heavy crates, boxes, barrels, bags, castings are conveyed gently at very slight inclines and at a moderate, uniform rate of speed.

Do yourself the good turn to look into gravity conveying. Drop us a line. We've a branch office near you, and a sales engineer courteous and willing to go over your plant and problems, point out the economies a Mathews can effect for you, and recommend the equipment your layout and business require—all without any obligation whatever on your part.

MATHEWS GRAVITY CARRIER CO.

122 Tenth Street, Ellwood City, Pa.

Branch Factories: Port Hope, Ontario. London, England

Member of Material Handling Machinery Manufacturers Association

MATHEWS
SPEED ECONOMY
GRAVITY ROLLER CONVEYER

Digitized by Google

Tycos
TEMPERATURE INSTRUMENTS



8000 *Tycos*

This is not the number of *Tycos* users. There are many times more than 8000 users of *Tycos* Thermometers. Eight thousand is the number of styles and types of Temperature Instruments manufactured by Taylor Instrument Companies. Among these 8000 types of temperature instruments one may be found that will fill your particular need. Whether you want to indicate, record, or control temperatures, let *Tycos* Temperature Instruments do it for you.

Tycos Temperature Instruments cover many fields of activity

Farm and Household

Thermometers for bath, cooking and fever. Hygrometers, Stormoguides, Incubator Thermometers, Dairy and Soil Thermometers.

Out-door life and meteorlogical

Compasses, pocket Barometers, Stormoguides, Rain and Wind Gauges, Auto-Altimeters.

Industrial

Indicating, Recording and Controlling temperature of all types and kinds.

There are *Tycos* indicating thermometers for places wherever a casual glance will be enough, or an index thermometer may be used to bring the reading out of dark corners into light.

There are *Tycos* Recording Thermometers that keep accurate undisputable records. A Bi-Recorder, or superheater will record steam pressure and temperatures on the same chart.

Tycos Temperature Regulators are so accurate they are uncanny in their control of temperatures. Manufacturers know the ability of *Tycos* Temperature Instruments to withstand the strains and knocks of every industry.

If you are interested in any of the above fields of activity, signify your interest in any of the above fields of activity and we will gladly send you informative booklets upon any subject. Industrial operators are invited to send for our general industrial catalog.

Taylor Instrument Companies

Rochester, N. Y., U. S. A.

ery purpose

There's a *Tycos* and *Taylor* temperature instru··

(*Continued from Page 54*)

ready working on units as high as 10,000 H. P.—quite an advance over the 25 H. P. engine of twenty-five years ago, and a very good exposition of the remarkable growth and perfected development of this highly efficient engine.

The Diesel engine differs from the gasolene engine in several fundamental respects: it is essentially a high-compression engine, in which only pure air (not the fuel charge) is compressed to some 480 to 550 lbs. per square inch, this compression itself raising the air temperature to about 1100° F. The fuel is injected through an atomizing valve, and is ignited (not exploded) on contact with the heated air; in other words, the temperature produced by compression is the means of igniting the fuel, without the need of hot bulb, hot plate, electric spark, or any other device. Lastly, the fuel oil continues to be injected during about 10 per cent of the working stroke; the "slow-burning" character of the combustion giving a steady push, rather than a sudden kick, to the piston. (Reference to the drawings on page 8, will help to make these points clear.)

Where gasolene engines are restricted to the use of gasolene, or gasolene and kerosene, the Diesel operates successfully on the much cheaper heavy oils and even on some of the crude oils as they come from the well, besides being able to utilize the heavier oils obtained from by-product distillation of coal. In other words, the Diesel engine as a prime mover offers all the advantage of low-compression and semi-Diesel engines (as outlined in "The Direct Route from Fuel to Power," *Industry Illustrated*, November, 1922) plus the additional advantage of a wider range of fuels, the ability to operate economically under varying loads, and the ability to operate without rest periods. Last and most important of all, the Diesel operates with an overall efficiency of from 32 per cent to 33 per cent, as compared with an overall steam plant efficiency of from 16 per cent (in the most up-to-date and efficient central power stations) to 7 per cent—the latter being a fair average for industrial steam power plants in this country.

With all these points in its favor, the growth of Diesel engine operation in this country has been extremely slow until very recently. Only in the last five years has there been anywhere near the recognition that this engine merits; and only in the last two years has there been a growth in the number of Diesel operated plants, commensurate with the demonstrated possibilites. Germany, Switzerland, Russia and England, before the Great War, were far in the lead; the United States, up to that time, had—industrially speaking—little interest in the subject. And it is only by sheer, demonstrated merit that today the Diesel is beginning to take its proper place in our power field.

As the Diesel has been perfected to its present state of development, its potential field has at the same time become more clearly defined. Predictions that it never could displace steam plants of large size, and predictions that it would entirely supplant steam, have both proved wide of the mark.

There are a number of industrial plants which require a large amount of steam in their processes—where, as a matter of actual fact, power is almost a by-product of the essential steam. Again, there are many plants whose power requirements call for an installation of less than 150 brake horsepower. Lastly, there are plants which (like the River Rouge plant of the Ford Motor Company) are able to link up their power units with coal-distillation and blast furnace units. In none of these would the Diesel engine in its pesent state of development prove economical.

When we come, however, to the large class of power plants—both central station and industrial—where units of from 150 H. P. to 2,000 H. P. are required, and where only small quantities (or none at all) of exhaust steam are needed for processes, the Diesel engine has proved its right to contend with any other kind of motive power on the score of economical power production. If we consider a more closely limited field—say, between 200 and 1,200 H. P. units (with the

(*Continued on Page 58*)

Digitized by Google

Side by side you find them

Performance of one leading to the purchase of another

The Fulton-Diesel has won the highest endorsement that can come through tests in service. In one case after another where there was a Fulton installation and additional horsepower was needed, another Fulton-Diesel was bought.

What happened in a western town with the problem of a central station that operated at a steady loss, is a typical example. A 500-horsepower Fulton-Diesel was installed in 1919. Immediately the plant began to show a substantial profit. The old steam equipment was kept for standby power, but comparison with the operating cost of the Fulton-Diesel proved this a mistake. So, in 1921, it was replaced by a second Fulton-Diesel, of 550-horsepower. Now, side by side, the two are effectively and profitably supplying the growing demand of this community for power. And coal has been no problem.

The Fulton-Diesel—American-built, stationary engine—is sold on the basis of cheaper power for industrial purposes. Using low-grade fuel oil in internal combustion, it consumes only one-third the fuel required to produce equal steam power. It is a self-contained power plant, without any auxiliaries. Feeds its own fuel, automatically controlled, has no waste to remove. One engineer runs it.

Applying the vast experience of 70 years of successful engine building, we have concentrated the past ten years upon developing the mechanical perfection of the Fulton-Diesel. Proved in many different and difficult tests of service, we know we can give no more valuable information to those directing American industry than this fact—that the Fulton Diesel turns power losses into profits. Ask us to send you—free and postpaid—a copy of a carefully written and fully illustrated booklet, describing the Fulton-Diesel in detail.

Fulton Iron Works Company, St. Louis, U. S. A.

Successful Engine Builders for 70 years

Branch Offices: New York - 82 Wall St. Dallas, Texas - Praetorian Bldg. New Orleans - Hibernia Bank Bldg. Havana, Cuba - 401-403 Banco Naciona



Put Your Power Problems up to Fulton Engineers

Our staff of experienced engineers is at your service for consultation on any power problem—anywhere and at any time—without cost or obligation. Fulton supervising engineers make regular visits to each Fulton installation to advise upon the most efficient methods of Diesel practice. Any plant engineer interested in Diesel operation may take this as a cordial invitation to visit our shops at St. Louis.

FULTON-DIESEL

Digitized by Google



Your Problems SOLVED With Facts

With your records placed on ACME VISIBLE EQUIPMENT every fact becomes instantly accessible—visualized.

Your eye is directed to conditions needing attention. When applied to your important records ACME VISIBLE EQUIPMENT will—

—Reduce Inventory
—Lower Operating Cost
—Limit Employee Turnover
—Speed Time and Cost Work
—Decrease Overhead Expense

In connection with every active record ACME EQUIPMENT instantly multiplies its value—gives more positive control.

The coupon with samples of your present cards or sheets attached, will enable our Service Department to outline in detail what ACME EQUIPMENT will accomplish for you.

ACME
CARD SYSTEM COMPANY
4 No. Michigan Avenue, Chicago

ACME CARD SYSTEM CO., Chicago, Ill. 1122II
Send catalogue and outline how Acme will benefit my work.
Kind of record *No. of cards*
Name
Address

(*Continued from Page 56*)

same low requirements for process steam)—the Diesel has demonstrated its superior economy over steam plants in any number of cases. In units below 150 H. P., the fixed charges per horsepower may be relatively so high as to outweigh the better thermal efficiency over steam power. Above 1,200 H. P. units, again, additional economies in steam plant operation become possible, and at the same time the higher cost of installation of the Diesel over the steam plant makes for increasingly high fixed charges as the power rating increases. This factor, however, is becoming less with the passage of time, as evidenced by the increase in size of Diesel units. So, broadly speaking, the logical, indisputable field for the Diesel engine at its present stage of perfection, lies in the plants of between 200 and 1,200 horsepower which require little or no process steam. In higher powers, individual conditions must determine between Diesel and steam; where large amounts of steam are needed, both Diesel and oil engine are eliminated; and between 150 and 200 horsepower, again individual conditions must determine between steam, oil engine and Diesel engine.

Prior to 1912, there were but one or two manufacturers of Diesel engines in this country; Adolphus Busch, of St. Louis having organized the pioneer company operating under license. In 1912, however, Doctor Diesel's patent protection expired, and from then on an increasing number of American manufacturers undertook the building of this type of engine; until today there are a score or more different makes of American-built Diesel engines.

Taking the country as a whole, a survey made by *Power* showed that there were, in March of last year, some 1227 Diesel engines in operation in stationary plants with a total rated horsepower of 292,673. Of these, about one-quarter are in central station service, and slightly more than one-quarter are on oil pipe lines. The balance are distributed among mines, quarries, ice plants, cement plants, chemical industries, water works (irrigation), flour mills, machine shops and miscellaneous other industries. And, where there were 1227 Diesel engines in operation less than two years ago, today there are more than 1500, with the number growing rapidly.

Having begun this discussion with figures, it is no more than fitting that we close it in the same way. The following table was compiled from the records of a Diesel engine power plant which replaced steam equipment, and is a typical example of actual results. In this plant a 500 H. P. engine was installed in January, 1919, and in August, 1921, a second unit was installed to take care of increased demands.

January, 1919—December, 1921

Year	K. W. H. Output	Gallons Fuel Oil	K. W. H. per Gal.
1919	1,522,300	119,932	12.7
1920	2,176,800	163,021	13.35
1921	2,344,785	192,979	12.1
Total, 3 years	6,043,885	475,932	

Average Efficiency.....12.7

It will be noted, by those conversant with Diesel engine manufacturers' guarantees, that this fuel oil efficiency is in excess of average guarantees—and this merely bears out the often-proved fact that these guarantees are usually conservative.

The oil dollar, then—reverting to our original comparison, and taking the average present-day fuel oil price—buys 476 brake-horsepower-hours in this Diesel engine plant. The coal dollar, in a plant getting 7 per cent overall efficiency, and assuming that we get a high-heat-value coal, buys but 171 brake-horsepower-hours.

Obviously, it would take a good deal of excess maintenance charges, installation charges or any other charges, to overcome this difference in fuel cost per horsepower-hour. Especially when we realize that sixty-five per cent. of the operating cost of a steam plant is the cost of coal.

Digitized by Google

Cutting All the Teeth of a Gear at Once

(Continued from Page 15)

train. The machine is seven feet high, weighs 17,000 pounds and when operating to full capacity is driven by a 100 H. P. motor. Its capacity is for gears 12 inches in diameter, 6 inch face, 4 diametral pitch.

The tool head consists essentially of a flat, steel disc 3 feet in diameter, provided with a hole at the center and a number of radial grooves cut in its face, in which the tool bits are arranged like the spokes of a wheel about the circumference of the gear. Successive feeding movements are imparted to the tools by an annular sectional cam ring. As the gear blank is reciprocated past the cutting tools, the tools are gradually fed in by successive cuts to the full depth of the tooth. At the completion of each stroke of the ram and before the next cut begins, the gear blank is indexed a space equal to one tooth, thereby presenting a different tool to each tooth from the one which made the previous cut. After the tools have been fed in to full depth, they are held stationary in that position while the cutting process continues until the gear has indexed one complete revolution thereby giving each tool an opportunity to take one last cut on each tooth. This final complete index insures a uniformity of spacing of the teeth in the gear equal to that of the indexing mechanism. Uniformity of the tooth form is secured even though the tools themselves may be far from uniform, for it is at once apparent that if any tool is longer or wider than any other tool, even though it be only a thousandth of an inch, that portion of it which is longer or wider will take one last cut on the corresponding portion of each tooth in the gear, thereby eliminating any variation which may have been caused by previous cuts. By this process of finishing all the teeth of a gear with a single finishing tool, this machine attains great accuracy and the speed is multiplied by the number of tools operating on the gear blank at one time.

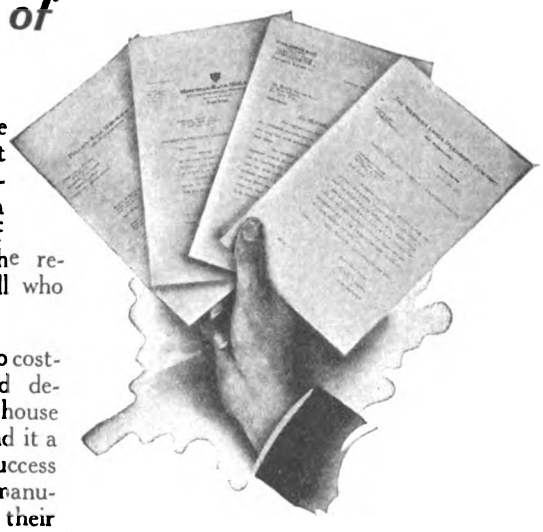
To technical men the most interesting individual mechanism on this machine is the tool head, as it involves the solution of the most interesting and important problems, both in design and construction. In the two illustrations of the tool head, the left-hand view is a top view of the tool head as it would appear when in operation on the machine; while the cut at the right shows the tool head partly disassembled and shows the principal details of the mechanism. When it is mounted on the machine, the only working parts to be seen are the points of the tool bits surrounding the gear blanks and the small depth adjustment dial seen in the upper part of the illustration. The four pairs of T slots seen in this illustration are for attaching a piloting device which is used on extremely long and slender arbors which may need an outer support. Two tool heads are provided for each machine and while one is in use on the machine, the tools of the other are being sharpened and re-set ready for use after the tools in operation begin to dull. The tool head is held in place by 8 studs and nuts shown in the illustration. When it is desired to set up a new job or to sharpen the tools, these 8 nuts are taken off and the tool head is lifted off of the machine bodily and is re-placed by the other tool head. This arrangement permits the machine to operate practically continually with very little loss of time on account of set-up and sharpening tools.

The tool bits shown are rectangular in section except the lower side which is in the form of a "V." The gear tooth profile is formed at the inner end of this tool and is backed off to permit sharpening without changing the form. The outer end of this tool rests against a spiral cam surface and is ground in the form of an exact radius. A small pin near the back end fits in a groove which has an opposing spiral surface and retains the tool in close contact with the other cam surface to insure correct contact at all times as well as to withdraw the tools to their

PEARCE
COMPLETE SERVICE

The purest treasure mortal times afford
Is spotless reputation; that away,
Men are but gilded loam or painted clay.
—*Shakespeare*

A Handful *of* Credentials



THE founder of the House of Pearce left his associates and successors the prestige of a name which, in years of achievement, earned the respect and good-will of all who became familiar with it.

On problems pertaining to cost-reducing machinery and devices, it is safe to let a house serve you that has behind it a progressive record of success in the development and manufacture of inventions from their original experimental state to their present-day standard—a house known for its fair dealing policy—proud of that reputation.

The following institutions are among those which have for many years valued their business relationships with us:

Nikola Tesla
Remington Typewriter Co.
Interborough Rapid Transit Co.
Dow, Jones & Co.
The Motor Meter Co.
Follett Time Recording Co.
Western Electric Co.
U. S. Bureau of Standards
American District Telegraph Co.
Holmes Electric Protective Co.
Inter-City Radio Corp.
American Taximeter Co.
Wright Aeronautical Corp.
E. Howard Clock Co.
Gamewell Fire Alarm Telegraph Co.
American Machine & Foundry Co.
Brands Restaurant Control Corp.
Individual Drinking Cup Co.
Scranton Button Co.
Duplex Lighting Works
Crucible Steel Co.
American Locomotive Works
Remington Arms Co.
Nathan Manufacturing Co.
U. S. War Department
U. S. Navy Department
De La Vergne Machine Works
Sperry Gyroscope Co.

A copy of "Turning Losses Into Profits"—The Book of Pearce Achievements—will be sent upon request on your business letterhead. Please address Dept. E.

FREDERICK PEARCE COMPANY
Incorporated *Industrial Engineers* *Established 1872*

18-20 Rose Street New York

"Trading for Over a Half Century on Successful Association with Leaders of Industry."

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Act of Congress of August 24, 1912, of INDUSTRY ILLUSTRATED, published monthly at Cooperstown, N. Y., for October 1, 1922.

State of New York, County of Otsego, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. R. Dunlap, Jr., who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Industry Illustrated and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form to wit:

1. That the names and addresses of publisher, editor, managing editor, and business managers are: Publisher, The Engineering Magazine Co., 120 West 32nd St., New York City; Editor, John R. Dunlap, 120 West 32nd St., New York City; Managing Editor, John H. Van Deventer; Business Manager, J. R. Dunlap, Jr., 120 West 32nd St., New York City.

2. That the owners are: The Engineering Magazine Co., John R. Dunlap, J. R. Dunlap, Jr., J. H. Van Deventer, Rutledge Bermingham, and Walter Ives.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bonafide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

J. R. DUNLAP, JR.,
Business Manager.

Sworn to and subscribed before me this 11th day of October, 1922.
(Seal.) CHAS. R. GOETZ.
(My commission expires March 30, 1924.)

Digitized by Google

starting position after the cut is finished.

The individual cam lugs are mounted on a large ring which encircles the tool bits and spacing plate and are held down by T bolts which fit in a circular T slot in the ring. The tool bits are adjusted for depth independently by moving these cam lugs individually along the T slot relative to the cam ring and each other. Simultaneous feeding movements are imparted to the cam ring through the two idler gears seen in the lower part of the tool head, and are produced by a feed mechanism which will be explained.

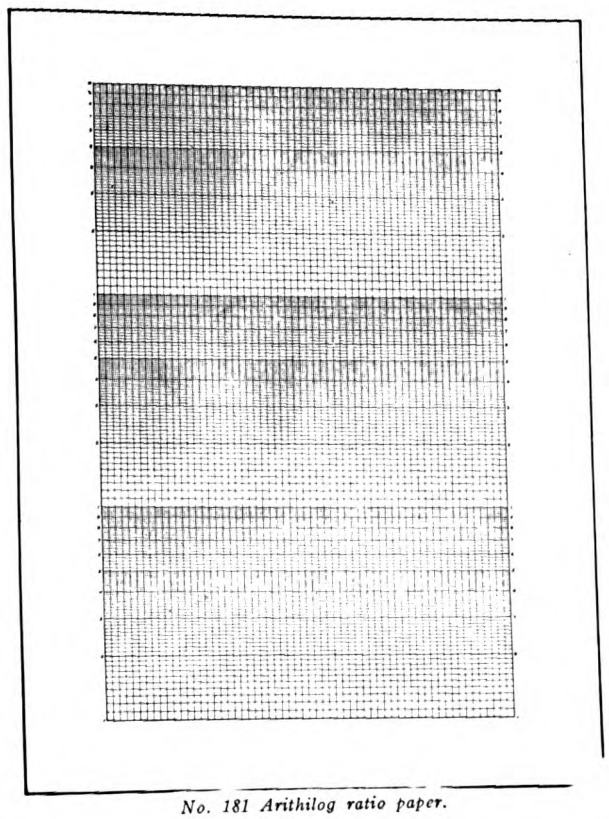
The final depth to which the tools are fed is determined by an adjustable stop which positively limits the rotary feeding movement of the cam ring. This feed mechanism being spring actuated, the position of the depth controlling stop can be varied within reasonable limits without re-setting of the feed mechanism. This is particularly desirable during the operation of the machine in cases where the tool bits may not have been set to exactly the right depth in the beginning or in cases where the keen edge wears off of the tools and they begin to cut gears that are uneven or oversize long before they are actually dull. The dial which controls this adjustment can be reset within less than a minute's time whenever the operator desires.

In order to provide relief for the tools on the back stroke of the ram, a reverse feeding movement is imparted to the cam ring, and before the beginning of the cutting stroke, the forward feeding movement of the cam is made great enough to compensate for the slight retraction for relief and also to provide the necessary additional feed for the depth of the next cut.

The work arbor used in this machine, as shown in the lower left hand illustration on the opening page, is provided with a taper shank and thrust collar and fits the tapered socket in the ram spindle. The thrust collar prevents the taper shank being thrust too tightly into the socket. The gear blanks are put on the arbor and fastened in place by a nut while the arbor is held in a

(*Continued on Page 62*)

EDEXCO CHARTING PAPERS
for putting BUSINESS RECORDS in GRAPHIC FORM



No. 181 Arithilog ratio paper.

1. They are printed on letter size paper, so that they are easy to file in letter files or bind up with typewritten reports.

2. Wide margins are left around engravings for insertion of scales, headings and notes. They are printed on white (on one side only) in a color of ink which reproduces readily.

3. They are printed on a paper which is strong enough to stand hard usage but which is unwatermarked and transparent so blueprints can be made.

4. Most EDEXCO sheets are specially divided for plotting business data by days, weeks, months and years and contain the right number of spaces for this purpose. EDEXCO curve cards also embody all these features.

TWO WEIGHTS

carried in stock for immediate delivery.

We also sell books telling how to use these papers. Our catalogue "H" describing these is free.

LABORATORY OUTFITS

Containing instruction pamphlets and charting paper to experiment with:

OUTFIT No. 3, on General Business Charting. $2.00
OUTFIT No. 4, on Semi-Log or Ratio Papers. $2.00

Shall we send you one or both?

Educational Exhibition Co. Graphics Headquarters
627 Custom House Street, Providence, R. I.



"IT'S YOUR ORDER, Because Your Company Has a PHOTOSTAT."

"This is a job where delivery is paramount. And, in every case, I have made it a point to find out what kind of equipment the bidder had in order to make good his promise.

"Your Company has a piece of equipment on which I have learned to rely. I know what the PHOTOSTAT is and what it can do. I know you will not have to lose any time tracing. You can make PHOTOSTAT copies and get started on your shop work right away. In other words you'll be days ahead and I also know that there can't be any mistakes in PHOTOSTAT copies.

"Yes, sir, you tell your chief he can thank the PHOTOSTAT for this order. I know you'll make delivery with that machine to help you."

PHOTOSTAT prints cost cents. Compare this with what it costs for a draftsman to make a tracing, a stenographer to copy a page, or an artist to reproduce a layout.

The experiences of many users, written in letter form, are contained in our booklet, "A Good Word for the PHOTOSTAT." Write for your copy today.

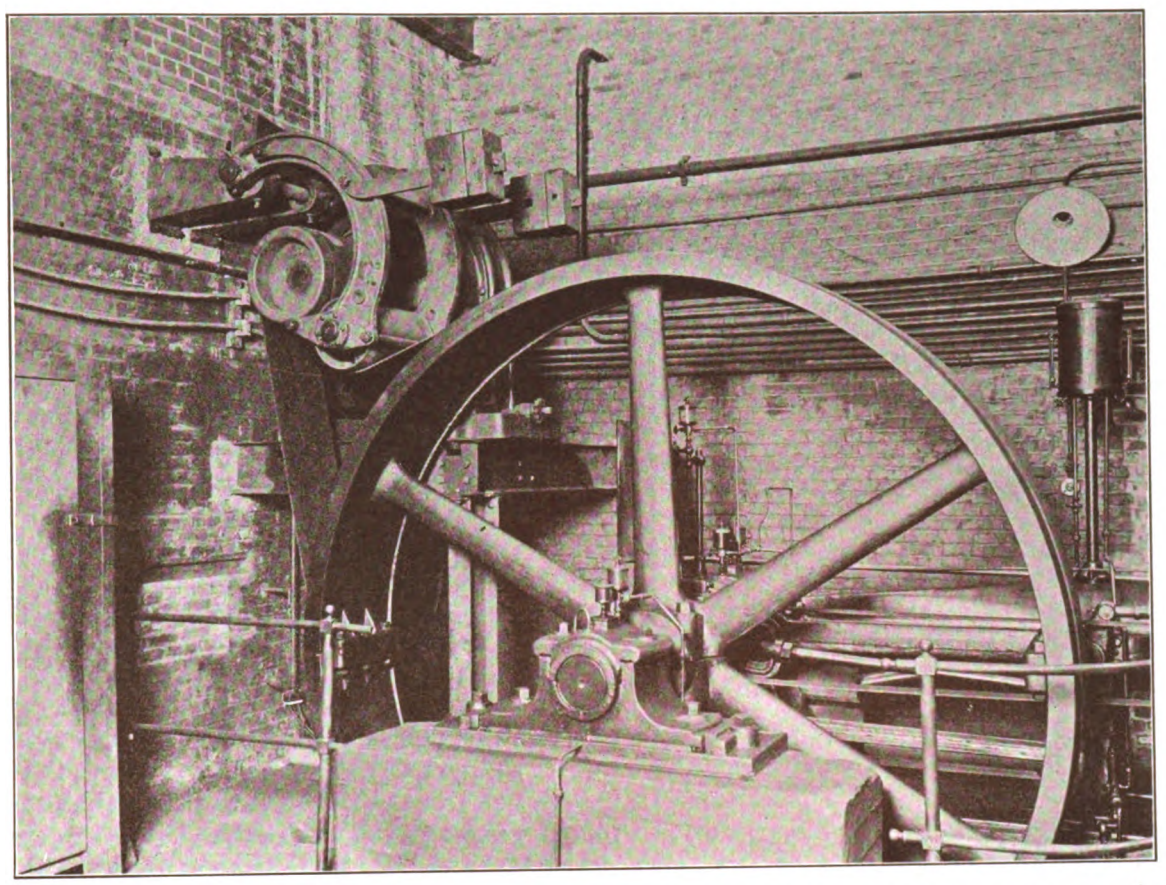
PHOTOSTAT CORPORATION
295 STATE ST., ROCHESTER, N. Y.

88 Broad St., Boston
123 W. Madison St., Chicago
209 Leader Bldg., Cleveland
7 Dey St., New York City
510 Nat. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
629 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington.

Executive Offices: Providence, R. I.

PHOTOSTAT
Trade Mark

Digitized by Google



Engine driven 90 K.W. Alternator, Alternator Pulley 17" dia., 18" face. 900 r.p.m. Flywheel 10' 0" dia., 22" face, 126 r.p.m. Pulley Centers 7' 6".

An Achievement in Belting Engineering

Five Points

1—The Lenix increases the arc of contact between belt and pulley.
2—The Lenix maintains constantly and accurately the proper tension in the slack side of the belt.
3—The Lenix saves floor space, building space and belting because of freedom in pulley locations.
4—The Lenix saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.
5—The Lenix permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

The installation illustrated above shows the possibilities of the LENIX drive. Most people would have thought this impossible but to the LENIX it was simply another opportunity to demonstrate its ability to transfer power from one pulley to another regardless of the relative positions of the pulleys.

You may never have as unusual a belting problem as this to solve, but you will always want to save FLOOR SPACE—you will always want to save POWER.

The LENIX by "wrapping" the belt around the pulley makes the short center drive not only possible but preferable. The belt is held against the pulley surface by a pressure that is constant and accurate regardless of load, atmospheric conditions or belt stretch. Slippage is eliminated.

There are more than 3,000 LENIX drives in operation in this country. There would be some in *your* mill if you were familiar with the advantages of this drive. You can get the facts by writing for a copy of "*Saving Slippage and Space*".

F. L. SMIDTH & CO.
ENGINEERS

50 Church Street **New York, N. Y.**

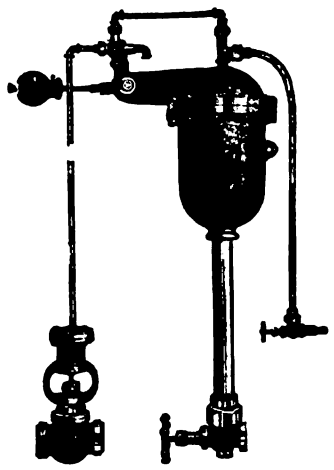
THE LENIX DRIVE

Digitized by Google

Now is the Time to Save Coal

by installing

VIGILANT
Feed Water Regulators



With this regulator you can keep water level constantly within one-quarter inch of center gauge regardless of load or method of firing, and thus be assured that coal is not being wasted unnecessarily.

Steady water level at all loads is essential to safety and to the highest overall operating economy for your boilers. The Vigilant Feed Water Heater, second to none, has been giving steady reliable service for more than 25 years.

If only for the protection it affords you ought to add this regulator to your equipment.

Get our catalog of this and other steam specialties that soon pay their own cost.

The Chaplin Fulton Mfg. Co.

28-36 Penn Ave. **Pittsburgh, Pa.**

Also Manufacturers of the Fulton Pump Governor, Tank Governor, Reducing Valve and Other Steam Specialties

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width	$10.68
9½ " "	11.93
11½ " "	14.00
12¼ " "	15.45
13 " "	16.00
14 " "	17.59
15 " "	18.84
18 " "	22.00
18¼ " "	22.90
24¼ " "	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. ***Our Customers will benefit.***

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of it's merits.

Rectigraph Company

(*An Independent Corporation*)

ROCHESTER, N. Y.

(*Continued from Page 60*)

vice like fixture attached to a bench at the side of the machine. After loading the arbor it is then dropped into the taper socket in the ram spindle and the machine is ready to work. The thrust of the cut forces the taper back into the socket until it strikes the shoulder of the arbor. The tight fit of the taper is sufficient to prevent the arbor from turning under the pressure of the cut but is not sufficient to make it difficult to remove. While one arbor of gears is being cut, another arbor is being loaded with blanks. As soon as the arbor in the machine is finished, the operator holding the arbor of un-cut blanks in one hand, stops the machine, presses a conveniently located foot pedal which by means of a long kick-out bar passing through a hole in the center of the ram spindle, knocks out the arbor of completed gears, and catches it in the other hand. He then drops the arbor of un-cut blanks into the open socket, touches the starter button and the cutting operation again proceeds almost without interruption. The entire operation of stopping the machine, of clanging the arbors and starting again, occupies less than one-half minute.

If it were necessary to remove the nut and change the gears on the arbor in the way that is usually done on other gear cutting machines, the machine remaining idle in the meantime, it will be realized that it would make a very material difference in the amount of production from the machine, when it is remembered that the total time of completing an arbor of gears ranges from one to three minutes.

The tooling up of a job on the multiple shaper offers unlimited opportunities for the exercise of ingenuity on the part of the set-up man or tool designer, both as to variety of the tool bits and their arrangement. In cutting some gears, it is desirable to use as many tools as there are teeth in the gear. In others it is more practical to use only half or a third as many tools as there are teeth. In an arrangement of this sort, a tool head equipped with any number of tools could cut gears having any number of teeth which is a multiple of the number of tools used. Thus a spacing plate having 10 tools could be made to cut 10, 20 or 30 teeth, etc. In a case like this, if it is desired to cut a number of teeth greater than the number of individual tool bits which can conveniently be placed within the space, a gang tool bit is used in which each tool cuts two or more teeth. This arrangement is particularly advantageous in cutting gears having a large number of very fine teeth, on account of the fact that although the amount of power required for the cutting of all of the teeth is very small, it would nevertheless be practically impossible to use as many individual tools as there are teeth in the product. Where it is desired to cut a gear having an odd number of teeth and it is not practical to use a tool for every tooth, as in the case of a 29-toothed gear for example, ten tools might be used. Nine of the spaces between tools would be equal to 3/29 of a circle each and the 10th space equal to 2/29. While the service on one tool would be slightly less than that on each of the other 9, the difference would be scarcely appreciable. In some cases, it is desirable to make every other tool in the form of some sort of a roughing tool, either a square-nose gashing tool or a stepped roughing tool of the usual type and so adjust them that they will remove most of the stock from the tooth space. The alternate tools are then made in the usual type of finishing tools and take the last few finishing cuts. At other times, a special cam is provided for one tool, so that this tool is held back during the stock removing cuts and is then suddenly fed forward ahead of the other tools to take the finishing cuts on all of the teeth. These various arrangements are merely suggestive of a few of the possibilities in this line. An unlimited number of possible combinations will suggest themselves to tool designers and set-up men acquainted with this line of work.

Digitized by Google

EVIDENCE

EXPERIENCE is being purchased every day by progressive concerns. Utilizing the experience of others has saved thousands of dollars of expense to shrewd executives who are willing to install in their organizations methods and equipment found efficient and economical by others. Can you afford to ignore such evidence as is presented that

TOWMOTORS

are the most efficient and the cheapest per hour of operation haulage equipment that you can buy?

With such firms as these, **TOWMOTORS** as time and money savers are practically indispensable:

The National Malleable Castings Co., Cleveland, Ohio
Chase Metal Works, Waterbury, Conn.
The Rail Joint Co., Troy, N. Y.
The Wilmington Compress & Warehouse Co., Inc., Wilmington, N. C.
Appalachian Corporation, New Orleans, La.
Chas. F. Felin & Co., Inc., Philadelphia, Pa.
Merritt Lumber Yards, Inc., Reading, Pa.
Norfolk Warehouse Corporation, Norfolk, Va.
The Peerless Motor Car Co., Cleveland, Ohio
The Chandler Motor Car Co., Cleveland, Ohio
The Cleveland & Buffalo Transit Co., Cleveland, Ohio
The Newton Steel Co., Newton Falls, Ohio
Henry Disston & Sons, Inc., Philadelphia, Pa.
American Dock Company, New York, N. Y.
The Cutler Hammer Mfg. Co., Milwaukee, Wis.
The Draper Manufacturing Co., Cleveland, Ohio
Rock Island Sash & Door Works, Rock Island, Ill.
Ball Brothers Glass Mfg. Co., Muncie, Ind.
The Mechanical Rubber Co., Cleveland, Ohio
American Steel & Wire Co., Cleveland, Ohio
The Lorain Castings Co.. Lorain, Ohio
Kurz Brothers Lumber Co., Chicago, Ill.
The Van Dorn Iron Works Co., Cleveland, Ohio
The Aluminum Co. of America, Massena, N. Y.
Stafford Mayer & Co., Ltd., Port Louis, Mauritius Island
Western Transport Company, Liverpool, England
Christian Fredriksen, Sydney, N.S.W., Australia
H. W. Johns-Manville, Inc., Waukegan, Ill.
Pouch Terminal, Inc., New York, N. Y.
Carnegie Steel Co., Painter Mills, Pittsburgh, Pa.
The Herbrand Co., Fremont, Ohio
The Ferro Machine & Foundry Co., Cleveland, Ohio
United Alloy Steel Co., Canton, Ohio
Endicott-Johnson Corporation, Endicott, N. Y.
Ludlum Steel Co., Watervliet, N. Y.

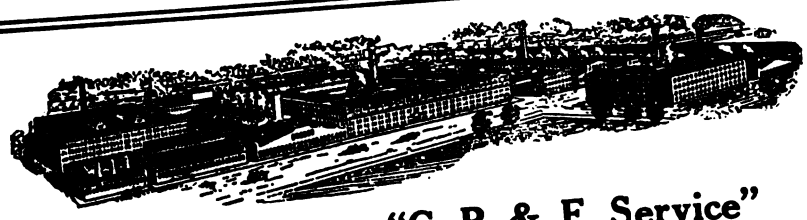
THE TOWMOTOR COMPANY

1226 East 152nd Street **Cleveland, Ohio**



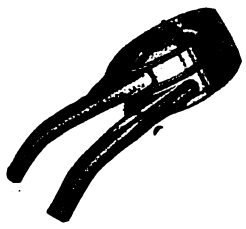
THE TOWMOTOR

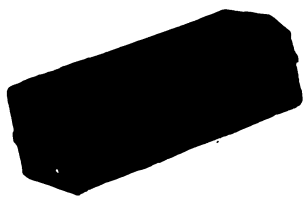
Digitized by Google



"G. P. & F. Service" Shows the Way Towards Lower Costs in

STAMPINGS and SHEET METAL PARTS







Send us your blue prints of sheet metal parts and stampings. Our Engineers can furnish estimates that in most cases are lower than the cost of producing them in your own plant.

Our figures reflect the economies of a fifteen acre plant, equipped with batteries of modern drawing, stamping, forming and punch presses of large capacity—adapted to handle the most difficult jobs without waste of time or material.

We also do hot galvanizing, terne coating, japanning, tinning, and porcelain enameling. In many cases we have developed pressed metal replacements for castings, forgings and wooden parts that are saving time, trouble and money.

G.P.&F. Service

Send Samples or Specifications. Let us show you how we can lower your costs and improve your product. Write today.

GEUDER PAESCHKE & FREY CO.
1300-1800 CANAL ST., MILWAUKEE, WIS.
DETROIT OFFICE: 712 DIME BANK BUILDING
CHICAGO: 352-358 WEST OHIO STREET



Why Take Chances

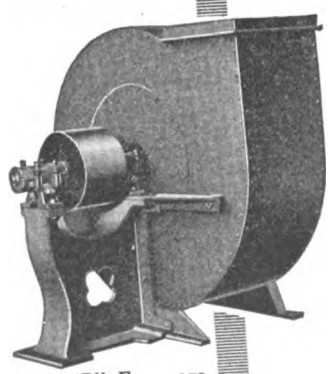
on having your exhaust system shut down indefinitely while waiting for a new fan-wheel to arrive, in case of a broken float, when you can get a fan with individual, easily replaceable floats?

Note how double angle supported floats are fastened to hub.

Bayley

Type "B" Exhaust Fans

reduce breakdown troubles to the lowest possible minimum. They have a perfectly balanced machined steel hub, and the double-angle-supported floats are riveted to this, (not cast in, as in ordinary fan-wheels). This assures perfect balance, and makes it easy to replace a damaged float without shutting down until a new wheel can be procured.



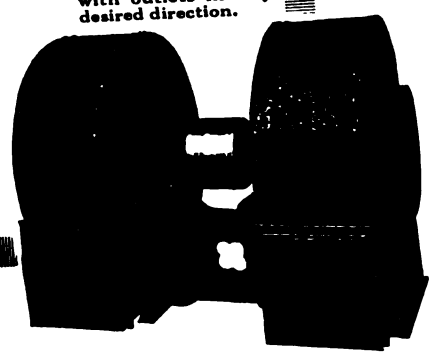
Type "B" Fans are made either in single or duplex formation, with outlets in any desired direction.

Bayley Engineers

have made a life study of shavings exhaust, ash conveying, forced draft and ventilating problems. Their services are yours for the asking.

Ask Today

BAYLEY MFG. CO.
Dept. P Milwaukee, Wis.



Graphics as a Production Stimulant

(*Continued from Page 18*)

Graphic methods of scheduling production and of following it up are employed to cope with this problem. They are in general similar to the graphical methods used in the other Westinghouse plants, and have been developed to a high degree of simplicity and effectiveness.

The controlling charts such as you may see on page 16 at A are combination monthly accumulative and current output quota charts drawn on ordinary cross section paper. The straight unbroken lines which are in red on the original charts represent the established quotas. As the month proceeds the actual performance record is superimposed so that at a glance it is possible for the production manager to see just how requirements are being met for any one size or variety of motor. One of these control charts is made out for each shop or special order or in other words for each type and size of completed article in production.

While these charts serve as the principal means of follow-up they are individually, when required, split into groups of *component part charts.* Thus an order for standard motors may be split into frames, field windings, armatures, shafts, etc. This enables the detailed following up of such parts as may be delaying the completed assembly, and this splitting up is used when and as required. In other words, if a control chart shows that the cumulative production fails to touch the quota line, subsidiary charts are at once made in order to remedy the trouble. These charts are of the same type as the control chart first mentioned.

The use of these charts is not by any means confined to the management. To do so would be to fail to take advantage of a well recognized principle that all employees work better when they can see their "score" plotted from day to day. In the principal manufacturing departments therefore, are bulletin boards such as shown at B on which are posted a set of the control charts covering the work of each department. Thus the foreman, department clerk and the workers in each department are informed at all times as to whether or not they are keeping up to the established quotas.

The use of this graphic stimulant to production is even carried a step further. In walking through the plant one notices small operation progress charts posted here and there at various machines or assembly benches. Each of these charts covers one operation, being of even greater detail than the subsidiary charts which cover all of the operations on one of the parts going into the assembly. In each case where such charts are posted, as shown at C it means that the operation at that particular bench or machine is either behind quota or needs watching to keep it up to quota. Usually very little is required to secure the desired re-

RECEIVER TURNER PANEL ASSEMBLY — Form No. E. S. 84 — S-307214

Turn in to Time Clerk each day all Operation Tickets completed. This is the basis of your pay.

Oper. 8 11100 Inspect Style S—307214 Badge		Oper. 8 11100 Inspect Style S—307214 Badge	
Oper. 7 11100 Final Adjust. Style S—307214 Badge		Oper. 7 11100 Final Adjust. Style S—307214 Badge	
Oper. 6 11100 Assm. Front panel Style S—307214 Badge		Oper. 6 11100 Assm. Front panel Style S—307214 Badge	
Oper. 5 11100 Inspect Style S—307214 Badge		Oper. 5 11100 Inspect Style S—307214 Badge	
Oper. 4 11100 Connect & Solder Style S—307214 Badge		Oper. 4 11100 Connect & Solder Style S—307214 Badge	
Oper. 3 11100 Assm. Coils, Term. Post & 3 cont. springs Style S—307214 Badge		Oper. 3 11100 Assm. Coils, Term. Post & 3 cont. springs Style S—307214 Badge	
Oper. 2 11100 Assm. large cond. Sup. & coil brkts. Style S—307214 Badge		Oper. 2 11100 Assm. large cond. Sup. & coil brkts. Style S—307214 Badge	
Oper. 1 11100 Assm. Small cond. & sw. Style S—307214 Badge		Oper. 1 11100 Assm. Small cond. & sw. Badge	Badge

Operators' Work Ticket.

Digitized by Google

Save Money With
KARDEX
TONAWANDA, N.Y. BRANCHES EVERYWHERE

This Issue of

Industry Illustrated

is Typical of the Broad, Interesting and Helpful Service it is Constantly Rendering.

ONLY the service is continually getting broader, more interesting and helpful.

Wonderful as has been the array of timely articles and illustrations it has been presenting to its readers right along, from the very beginning, it is only beginning to scratch the surface of of the immense possibilities that lie in the power of the camera to catch for the busy man vitally important and usefulinformation that he would otherwise pass by.

Great things are coming. You will not want to miss them, even if, by any chance, you might think you can afford to miss them.

If you are already a subscriber, see to it that your subscription is renewed promptly. If you are not now on our lists for your own personal copy, put yourself there at once. See this coupon below?

---Mail this Coupon TODAY---

Industry Illustrated
120 West 32nd St., New York, N. Y.

Send me a copy of Industry Illustrated every month for a year. I shall remit on receipt of your bill—in the next 30 days or so. (If a renewal of a present subscription, check here.....)

Name.....

Address.....

Company..... Titl.....

Annual Subscription Price, $1
In Canada, $1.25; Foreign, $1.50

(AD-L)

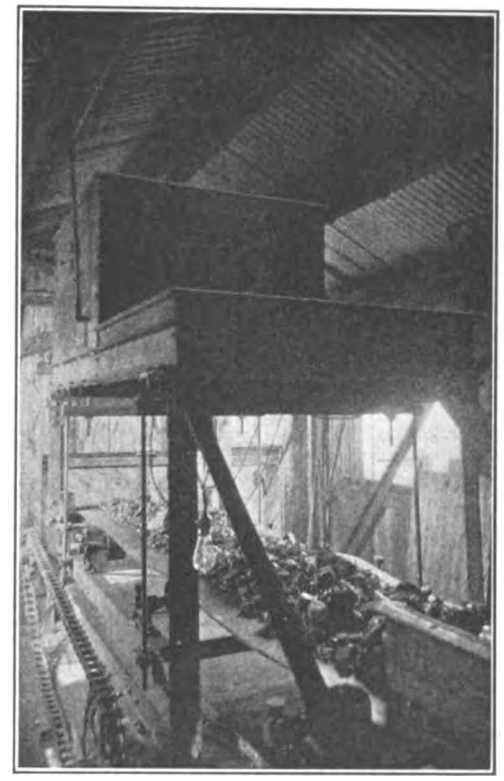
sults other than the mere posting of one of these charts. When conditions require it, the progress is sometimes checked up hourly.

The use of this quota method of charting and following production is based on the principle of establishing *rates of production* for each order, whether this be a special order or a shop order for standard motors. To make sure that in the latter case the required delivery dates of shipment are being made on customers' orders, a further step is necessary. This is because a manufacturing quota or rate may be satisfactorily maintained and yet without assurance that the required priority of shipment is secured. A simple, yet ingenious, plan takes care of this point. This consists of giving every order, whether special or shop order, a required date of completion. If it is a special order this date is of course a day or two prior to the date of shipment promised to the purchaser. If it is a shop order the date of completion is the end of the month and the quantity is the monthly quota. Records are kept for each department, known as delayed order efficiency records. Thus if there are ten orders in a department during a given month, five of which have been completed on time and five of which are behind time, the efficiency of the department is fifty per cent. Thus in order to maintain its prestige in the eyes of the management a department must do two things; first, its quota control charts must show that the scheduled rate of production is being maintained; second, it must stand well in the matter of delayed orders.

That such a simple plan as this works so well under such difficult conditions as represented by the production undertaken at East Springfield, is an indication that it ought to work admirably where similar conditions are encountered and where red tape is not prized for its complexity.

SAVE TIME AND LABOR
Use The
MERRICK CONVEYOR WEIGHTOMETER

Any material which is conveyor handled can be weighed without additional handling or loss of time by the Merrick Weightometer.

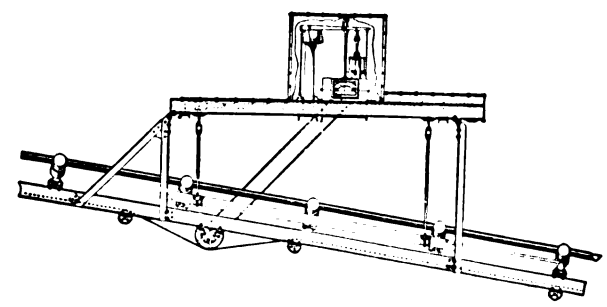


TYPICAL INSTALLATION MERRICK WEIGHTOMETER

Hundreds in use weighing all classes of materials such as

coal, run o'mine and crushed.
Coke
Stone, coarse and fine.
Gravel.
Sand.
Cement Rock.
Cement Clinker.
Metallic Ore.
Phosphate Rock.
Phosphate Pebbles.
Wood Chips.
Sulphite Pulp slabs.
Fish and Fish Products
Finished Cement
Zinc Ore,
Iron Ore.
Copper Ore.
Lead Ore.
Gold Ore.
Silver Ore

NO WEIGHMAN OR ATTENDANT REQUIRED
GUARANTEED AND PROVEN
99% ACCURATE



Method of Installation

Why rely on Bill of Lading Weights?
Why not be able to tell exactly how much material you receive?
Hundreds of concerns buy and sell their products using Merrick Weightometer weights.

For Information Write

MERRICK SCALE MFG. CO.,

180 Autumn Street PASSAIC, N. J.

Digitized by Google

MATERIAL



ELECTRIC TRACTORS

Transport Tons

where hand trucks move pounds. They reduce expense in all your departments.

Request Catalog 1208.

The Elwell-Parker Electric Company

Cleveland, Ohio



"High Duty" Magnetic Pulleys

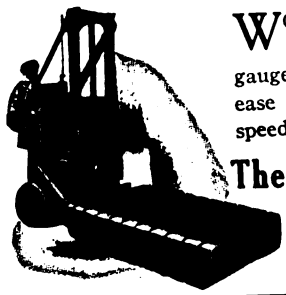
For removing iron and steel from conveyed materials. Will positively protect your crusher, grinder or pulverizer against injury from "tramp iron."

Magnetic Mfg. Co.

267-275 23rd Ave, Milwaukee, Wis.

POWELL Pressed Steel Platforms

Adapted to all Hand and Electric Lift Trucks



WORKMEN like them. Managers like their long life and low cost. Pressed from a single piece of heavy gauge steel. Jointless, rugged and powerful, they create ease and rapidity of handling loads, cutting costs and speeding operations.

The POWELL PRESSED STEEL CO.

HUBBARD, OHIO

SUBURB OF YOUNGSTOWN

For lower handling costs—

Northwest Cranes—with clamshell bucket or grappling hooks; as a pile driver.

Northwest Draglines—for drainage jobs, excavating, grading.

Northwest Shovels—with only one motor—gas or electric.

A complete line proved in service. Patented crawler base provides

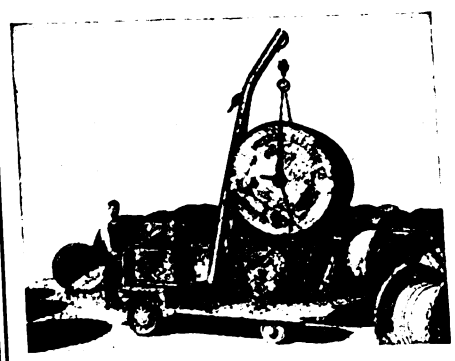
Unequalled Mobility

NORTHWEST ENGINEERING CO., Chicago



The Northwest Crane, shown below, cuts handling costs in a thousand and one operations. Write—

Northwest Crawler Cranes—Draglines—Shovels



Easiest Way to Handle 3,000 Pound Pieces

is on Electric Industrial Trucks equipped with REVOLVING CRANES.

Bulletin 51 tells how.

The Elwell-Parker Electric Company

Cleveland Ohio

HANDLING

Getting Out from Behind the Horse

(*Continued from Page 19*)

that started him. Before he was sixteen he had such a fair working knowledge of the subject that he had devised an apparatus which made oxygen gas, and constructed it out of materials such as he could find in a little town where there was not a piece of glass tubing to be had, for example. He was not able to get to college until he was twenty-one years of age, but the equipment available to him at Worcester Polytechnic Institute was like a rare instrument to a musician. Instead of pottering with set experiments he did original research work, and did it on such lines and so effectively that he discovered or invented tungsten steel and made that alloy the subject of his graduating thesis. He went on experimenting until he was making a number of steels in combination with nickel, chromium and other rare metals. Pigeonhole that fact for a few minutes until the story goes a little farther along, and see how Haynes, by pursuing one line of study and work, got cumulative dividends out of it.

He quit teaching in 1886 to become, first, manager of a local natural gas company, and then field superintendent of a larger company which was to supply Chicago with natural gas. The things he ran against in this new business, some people would have called obstacles, or at least difficulties. With Haynes, they just served to start his inventive faculty into action. Of course, there were delays in constructing the long pipe line. Then, when it finally was finished, in a few days it froze up with the moisture contained in the gas. Haynes settled that by simply playing Nature's own game, but in his own way. He built a refrigerator, ran the gas through it, and froze the moisture out of it before it was turned into the pipe line. Then he devised a pressure regulator. And a vapor thermostat to regulate the temperature of a room heated by natural gas.

"Construction of the Chicago pipe line began late in '89 and took the best part of a year to complete," said Mr. Haynes. "Naturally I had to do a great deal of driving up and down the line. I don't know just when it was, during those long drives, that I got to thinking how much time it wasted, to have to sit behind a horse hours and hours every day; how slow and how lacking in endurance the animal was; and whether some kind of a mechanical vehicle could not be contrived to take his place. The long drives, though, did have one advantage just at that time. They allowed me plenty of time for thinking, and my mind pursued that line of thought more and more definitely. I weighed the possibilities of steam and electricity as the motive power for such a vehicle, eliminated both of them, and decided the necessary power could be supplied best by a gas engine.

"That much being definite in my mind, I made a decision. For the second time I quit a good job, and set myself to studying, planing, drafting, experimenting for nearly two years. In 1892, having completed a set of plans which looked as if they might work, I moved to Kokomo, where the Haynes automobile business has been located ever since. It was not until late in 1893 that I began the actual construction of my first vehicle by buying a one-horse power two-cycle marine gas engine. I used the marine type because, for the same power, it was a lighter engine than the stationary; and also it was constructed with a view to operating conditions more nearly like those to be encountered in a moving vehicle, since it was built to be used in a moving boat. I built this first machine with a one cylinder motor, ball bearings and pneumatic tires. Instead of setting the motor over the axle, the modern chassis was anticipated by suspending in a special frame of its own. The result was that I had a machine weighing altogether 820 pounds which, in every essential was the modern automobile, and was the first American car to get beyond the experimental stage and meet the conditions of actual use.

Digitized by Google

"It was on the Fourth of July, 1894, that this car was given its first road run. I had a horse pull it from the shop about three and a half miles. Then I drove it a mile and a half farther, I stopped, turned around, and drove the five miles back to town in a little less than an hour. Of course, it made a sensation—several sensations, in fact, ranging all the way from derision to amazement and fright. The Smithsonian Institute now has that pioneer "horseless carriage" among its exhibits in Washington.

"Although the machine had proved it could run, I continued my experimental work for four years more before I felt the machine had reached the point where it was ready for manufacturing and marketing. My work on steel and other alloys stood me in good stead here. In 1895 I made the crank case of aluminum. Then I used nickel steel for the axles. With the 1895 car I drove to Chicago to take part in the race promoted by the Times-Herald. My trip was chiefly remarkable, as I look back on it now, for the fact that a policeman ordered me off Michigan Boulevard! I wonder if he remembers it as I do.

"In 1898 the Haynes-Apperson Motor Company was organized, and has been in continuous existence ever since, though the Apperson brothers left four years later, so the company has since been known as the Haynes Automobile Company. We decided to make fifty cars the first year. Then we hearl that a competitor was going to make 100 cars and we were worried with fear that the United States might not care to buy 150 cars. Our fears were groundless, however. Five of our machines were taken for use in Porto Rico on the mail routes. I myself delivered a car we sold to a Brooklyn physician, driving it the thousand miles across country, a feat which attracted a great deal of notice. The trip was made at an average speed of fourteen miles an hour. That's a couple of miles per hour better than the stage coaches used to make from London to Brighton in Dickens's time.

"From that time on, it has been a case of steady development. We were the first to break away from the horseless carriage idea and build a car that was a motor car, and not merely a carriage with a motor instead of a horse. It takes a while, you know, for our minds to make those transitions from old forms to new. Gas stoves were built like coal stoves for a long time, with the ovens down below, just because they always had been there, until it occurred to somebody that they didn't have to be there, but could be up on top, in a more convenient position. In several other improvements we pioneered, like electric ignition, the magneto, the throttling carburetor, a double set of spark plugs, and the jump spark."

Even during the years of development of the Haynes automobile and of a great manufacturing business to put it on the market, Mr. Haynes, has been the scientist and inventor in other lines. Steel alloys seem to be a hobby with him, for as recently as 1919 he received a patent for "stellite," or stain less steel, which he had invented in 1911. A rotary gas valve engine is another of the incidental products of his genius. That he is something more than a manufacturer is evidenced by his membership in several of the great scientific societies here and abroad. Hale and hearty at sixty-five, Elwood Hynes is a splendid example of the strenuous, creative American. "I did not develop the automobile, nor have I ever worked out any of the other things I have undertaken, as a commercial enterprise primarily. Just as I got thinking how slow it was to sit behind a horse and depend on his limitations for carrying out tasks that were no concern of his, so I have always done these things for the sake, first of all and most of all, of serving men's necessities or convenience. Of course, to produce the things that people need or want, in quantities that will bring the cost within reach and to distribute those things to the greatest number of people, who need them or want them, is business, commerce. And in order that business shall not stop its functioning, it must be, and has a right to be, profitable to a reasonable extent. But the profit is not the reason, to my mind, for the existence of the business."

MATERIAL



Chain Hoists for All Purposes

¼ to 30 Tons Capacity

SAFE DEPENDABLE ECONOMICAL

Our catalog will interest you

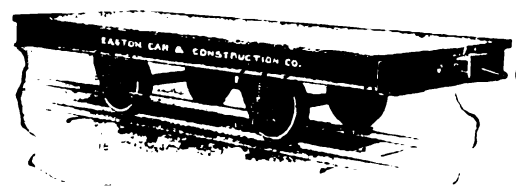
WRIGHT

Lisbon, Ohio



EASTON CARS

EASTON CAR



COMPLETE INDUSTRIAL RAILWAY EQUIPMENT

2178-

EASTON CAR AND CONSTRUCTION CO.

Main Office & Works: Easton, Pa. Branches in Principal Cities



COAL STRIKES

will not jeopardize your fuel supply if you are equipped with ROBINS CONVEYORS for storing coal.

Write for Bulletin No. 54 and learn how

ROBINS CONVEYING BELT COMPANY

New York Chicago Boston Pittsburgh



THROW AWAY YOUR WHEELBARROW and get a

BRADY

STEAM JET ASH CONVEYOR

Save hundreds of dollars. BRADY STEAM JET ASH CONVEYORS are saving money in hundreds of plants. Tell us your problem; send for our "Book of Facts."

We will show you just what we can save you.

THE JAMES A. BRADY FOUNDRY COMPANY

4510 Western Blvd. Chicago, Ill.

Also manufacturers and designers of Pneumatic Conveyors for handling granular and pulverized materials of all kinds.

MATERIALS HANDLING EQUIPMENT THAT CUTS COST TO BEDROCK

HAISS





Portable Belt Conveyors—Truck Loaders

Catalog on Request

THE GEO. HAISS MANUFACTURING CO., Inc.

146th St. & Canal Place, New York

HANDLING

Digitized by Google

MATERIAL

"Handling" is the wrong word

when applied to Dow Conveyors. *Handling* suggests *carrying by hand* whereas the very purpose of Dow Conveyors is to dispense with costly human effort in moving parts and finished products from one place to another. Dow Conveyors (Gravity and Power) do away with porters and enable the skilled mechanic to devote *all* of his time to production instead of intermittently walking the floor. Many manufacturers are not aware of the time-labor-and money-saving ability of Dow Conveyors. The facts are yours for the asking. The Dow Co., Incorporated, Louisville, Ky.





DOW CONVEYORS

LEWIS-SHEPARD means LABOR SAVING

in Material Handling Equipment

Jacklift Elevating Trucks

The Master Stacker (or portable elevator)

Steel Leg and Wood Platforms for Lift Trucks

Self-loading Barrel and Case Truck

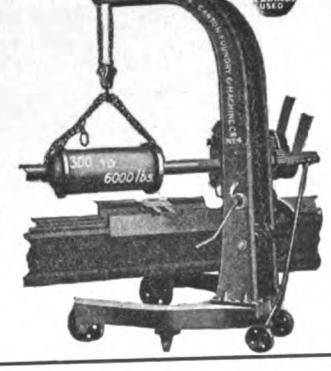
Our representatives are at your call and are prepared to render a real material handling service. Call on us.

LEWIS-SHEPARD COMPANY, 582 E. First St., Boston 27, Mass.

CANTON Portable Floor CRANE

Makes One Man's Time Worth Six

Truly "The Handiest Tool in the Shop." Goes where nothing else can reach. The CANTON will lower your lifting costs. *Send for catalog* F. 15



CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
Permanent Exhibit Salesroom, Grand Central Palace, New York

With the January issue the rate for space in this section will be $20.00 per advertisement. We are offering these until then at 18.00 per month.

This small announcement will absolutely pay you in big dividends and will secure from INDUSTRY ILLUSRRATED'S 20,000 executive readers ad attention far out of prortion to its cost.

Copy for the January issue can be received up to Ddcember 14th.

SEND IT IN IMMEDIATELY

Advertising Department

INDUSTRY ILLUSTRATED

120 West 32nd Street

New York

HANDLING

When One Department Has the "Backing" of the Others

BY L. E. DIX

A foreman of this plant read a paper at our last meeting in which he made the following appeal to his brother foremen:

"Our aim is to have the good will and confidence of every foreman in the yard. You here, and most of your men are fully experienced in your work. Being a new department we are not as experienced in our work, and seek your co-operation and aid in making our work of the utmost value. Help us to help you."

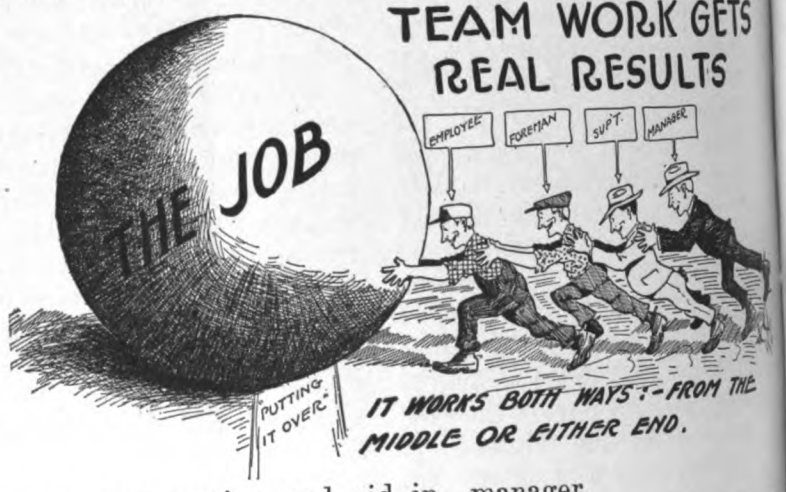
In these words this foreman voices the desire of every foreman interested in the growth and success of his company and therein is signified an obligation, the fulfillment of which is the master key to harmonious operation.

In trade for service a foreman must give service, as service is the medium of exchange by which the ultimate purpose of his organization is carried forward to its goal; profit for his company.

When a new department is established or a man placed on some special line of work and the work is not followed up closely, and the man in question does not receive the concentrated "backing" of every other person working toward the same point, the objective is hampered and they are "milling around" so to speak.

Those who criticise any movement for efficiency or improvement are not really obstacles—not enemies at heart—they are simply snapping at the heels of progress.

The manager's office is helpless without the "backing" of his superintendent. The superintendent's office is worthless without the "backing" of the foremen and the foremen are powerless without the "backing" of one another and of their men. And, reversing this outline it can so well be proven that the men are lost without the "backing" of their foreman, the foremen are useless without the "backing" of the superintendent and the superintendent will "fall down" without the "backing" of the manager.



Now in transferring this subject of "backing" to the talents and ability of individual employees, there stand out many advantages to be gained by a study of this matter by foremen, and when one foreman discovers a man of special talent or ability and takes it upon himself to see that this employee's knowledge and competency are passed on to another foreman who in turn brings out the utmost in productiveness in this man's work, the one foreman is "backing up" the other in the true sense of the word.

When a foreman orders work through another foreman and sees that this piece of work is clearly outlined, that the equipment in question is prepared and ready for the work to start, and when he avoids delays or mistakes by keeping an eye on the job, and when the foreman whose men are doing the work follows and considers the desire of the other foreman, we have an example of "backing" that cannot fail to produce.

The effect of support is evident in manufacture as in sport and the defeat of the unsupported pitcher in a ball game is proverbial.

Digitized by Google

Every foreman is a pitcher in the manufacturing game. He is there to win his game and as he endeavors to put some advantageous effort through in his department he must be "backed" by his field, the other foremen, who each in turn sees the time come when he must step into the pitchers' box—where he wants to feel that surrounding him—back of him—are the men who really are the key to the situation and with the assurance of their support his energy and ability are formed into that thing for which every commercial organization is operating—profit.

A foreman is provided opportunity to see efficiency through the recognition of inefficiency. Some system or method is failing or requires a different application. When he endeavors to make the desired connection along these lines the occasion is offered whereby he may "lay his cards on the table" by presenting the facts or faults and prove his worth in a substantial manner. A frank "I don't know," "I'm up against it" or, "I need help" is worth a lot more money than an attempt to proceed under some failing system.

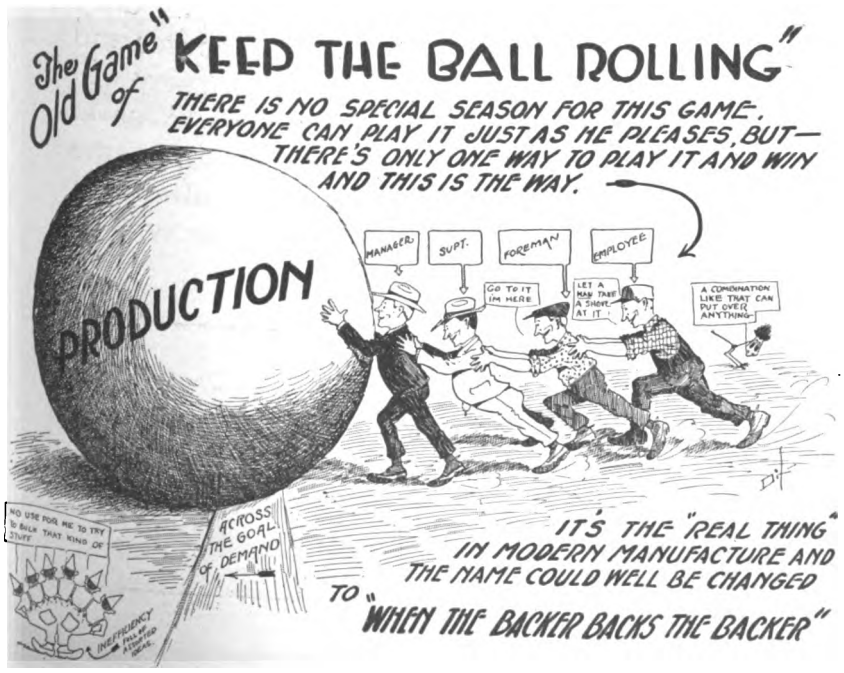
Frequently a case demands immediate action. It may require some thing unusual. The foreman may have to step out of his fixed jurisdiction in the interest of something that means time and money to his company.

A matter of this kind is very simple yet constructive if all concerned are looking at it in the big way—the way that leaves personal distaste or wrong opinion. Every organization of this kind commands the unqualified "backing" of its foremen individually and collectively.

Fortunately the foreman of a department has occasions to make suggestions favorable to some other department, but he is cautiously or timidly, or, we might say, foolishly considerate. He is afraid his ideas may not be welcomed. As a matter of fact, ambitious foremen are on the lookout for good ideas, regardless of the source, realizing that it is impossible for one man to grasp every phase of any given situation. Now when these two foremen get together—when each understands that it is as much to his individual credit to obtain these suggestions from other foremen or from the men under him—to cast about himself the receptive relationship that encourages these little helps—then is created that "backing" which gets what we're after.

It is along these lines that any group of foremen can be moulded into a combination of strength and soundness, the foundation of which is faith in one another, and structure of which is support of one another.

Impelled by the forceful influence of "backing," every foreman devolves into a powerful unit of accomplishment. Working alone he flounders—is stagnant—unproductive. "Backed up," he creates,—builds—produces and shares, in the satisfactory returns which are sure when all are for one and one is for all.

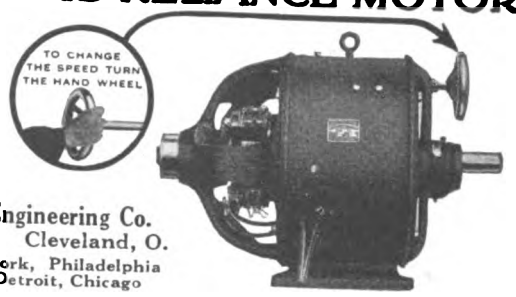


POWER

THESE motors will provide your machines with operating speeds to suit all kinds of jobs. They run at any speed over ranges up to 1 to 10. There is no power lost as speed is varied.

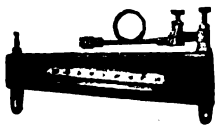
Get bulletin 1014 for details

Type A.S. Adjustable Speed RELIANCE MOTORS

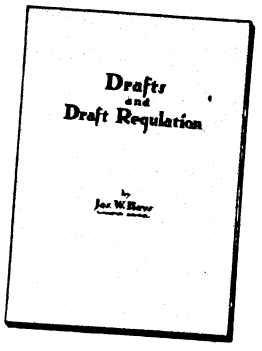


Reliance Electric & Engineering Co.
1045 Ivanhoe Road Cleveland, O.
Branches: Boston, New York, Philadelphia Pittsburgh, Cincinnati. Detroit, Chicago

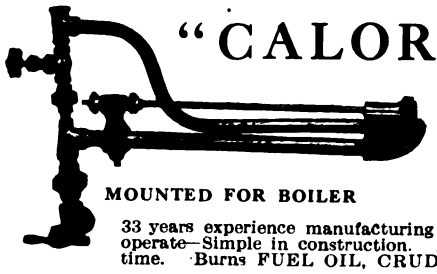
An Interesting Booklet for the Asking



The greatest cause of fuel waste is faulty draft regulation—too much excess air diluting the gases of combustion and cooling the heating surfaces. Mr. Hays' treatise on "Drafts and Draft Regulation" contains a fund of sound, practical information on this important subject.
It also describes and illustrates various types of Hays' Draft Gages, which rugge instruments are designed especially for use in the boiler room.



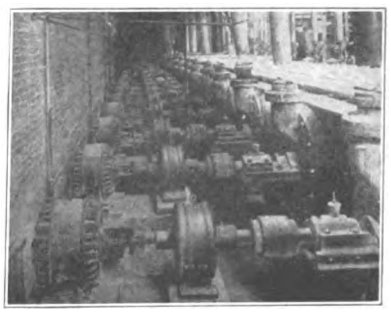
The Jos. W. Hays Corporation
Combustion Efficiency Appliances
Michigan City, Indiana



"CALOREX" Burners
Using STEAM or AIR for Atomizing
MOUNTED FOR BOILER

33 years experience manufacturing liquid fuel equipment. Cheapest to operate—Simple in construction. *No parts to wear out*—Will last a life time. Burns FUEL OIL, CRUDE OIL or TAR. Write for catalog

W. N. BEST FURNACE & BURNER COMPANY
11 Broadway ENGINEERS IN CALORIC NEW YORK



Battery of James Spur Gear Speed Reducing Transmissions doing continuous heavy duty without interruption.

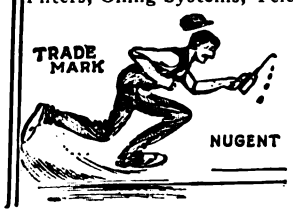
D. O. JAMES Manufacturing Co.
1114 W. Monroe St., Chicago, Ill.

NUGENT Automatic Alarm OIL FILTER

Automatically informs the engineer when the filtering material and bags need cleaning. This alarm may be wired to the chief engineer's desk.
Write today and get full particulars about this wonderful "human" Filter. Send for bulletin "H".
We are the largest and oldest Company in the United States that manufactures Oil Filters, Oiling Systems, Telescopic Oilers, and Oiling Devices exclusively.

THE FULL NUGENT LINE

Oil Filters
Oiling Systems
Filtering Systems
Anti-Packed Telescopic Oilers
Oil Pumps
Oil Tanks
Oily Waste Presses
Oiling Devices
Oil-from-the-Floor Shaft Oilers

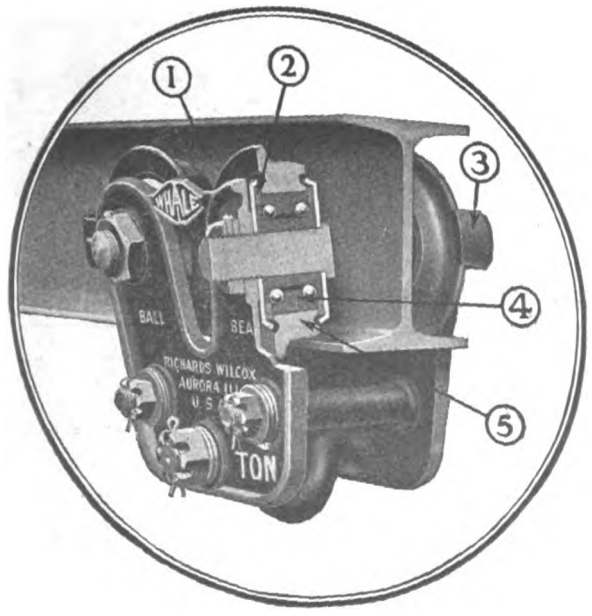


WM. W. NUGENT & CO.
410 N. Hermitage Avenue, Chicago
Established 1897

EQUIPMENT

Digitized by Google

"Yale" Swallows "Whale"



THE Yale & Towne Manufacturing Company have requested us to discontinue the use of the word "Whale" in connection with our improved ball-bearing I-beam trolley. They contend that it is too easily confused with the name "Yale" which they use on their products.

Of course, in adopting the name "Whale" we had not the slightest intention of trading on their reputation. We called our trolley the "Whale" because it is precisely what the name implies—***a whale of a trolley.*** We, too, have no desire to have it confused with any other, so we have willingly agreed to change the name.

POINTS TO CONSIDER IN SELECTING A NAME

1 Because of its short wheel base, the "Whale" operates almost as easily on curves as on a straightaway. Tests have proved that a boy can operate the one-ton "Whale" even when it is loaded to capacity.

2 Felt washers prevent gritty dust and dirt from reaching the bearings. They also provide perfect lubrication, as the felt absorbs oil from the oil hole and transmits it to the bearings continuously.

3 Another exclusive feature. Bumpers protect all four wheels from shock when trolleys bump together or strike stop at end of track. It is practically impossible for the wheels of the "Whale" to become chipped.

4 Combination and radial thrust bearings are found only in the "Whale." The ball races are ground and the balls themselves are of high duty steel. This feature enables a one-ton load to be started by the pull of a man's little finger.

5 Reduced friction is assured by crowning the wheel treads. Also, the treads are chilled to give maximum hardness and minimum wear. This is another reason why the "Whale" will withstand long years of hard service.

$50.00 for a Name

It occurs to us that you men who know the many superiorities of the "Whale" trolley are best qualified to rename it. To repay you for your trouble, we are offering a cash prize of $50.00 for the most fitting name submitted.

This time we want a name that can't possibly be confused with any other. The "Whale" is so far superior to ordinary trolleys that we wouldn't think of giving it an imitative name. Study the various exclusive features described at the left and see if they don't suggest a name that is as distinctive and strong as the trolley.

Contest Closes Jan. 1, 1923

This contest is open to every person who cares to compete. Only our employees are barred. The President, Secretary-Treasurer and Superintendent of the Richards-Wilcox Manufacturing Company will be the sole judges, and all suggestions should be addressed to us at Aurora. The contest closes January 1, 1923, and the winning name will be announced in this and similar publications as soon after that date as it is possible. In the event of a tie, a $50.00 prize will be awarded to each person submitting the winning name.

Also manufacturers of FyeR-Wall corrugated and tin-clad doors. Automatic fire door hardware, etc.

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides."

AURORA, ILLINOIS, U.S.A.

Minneapolis, Philadelphia, Chicago, Boston, New York, St. Louis, Cleveland, Indianapolis, Los Angeles, San Francisco

RICHARDS-WILCOX CANADIAN CO. Ltd.

Winnipeg, LONDON, ONT., Montreal

"Slidetite" sliding-folding door hardware is unsurpassed for garages and general industrial uses.

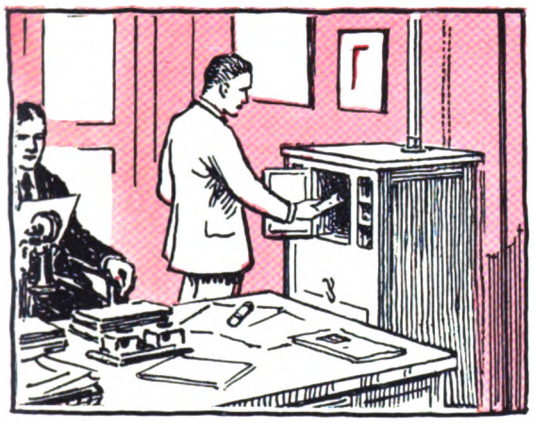
Digitized by Google



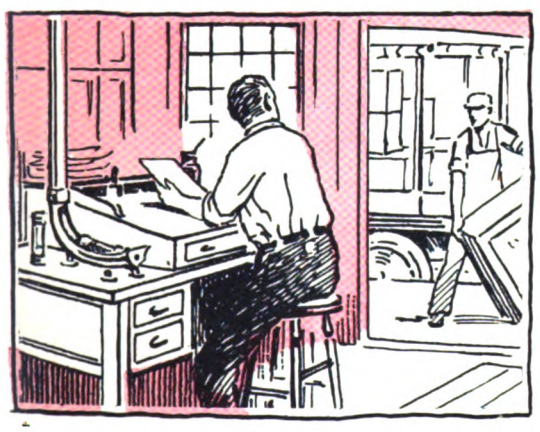
Showing the cabinet containing the power unit of the Junior Tube System. The clerk is placing the carrier in a tube. A turn of the lever and the message is shot through.



At the other end of the tube. Another clerk is turning a switch that reverses the power. The carrier is drawn back to the cabinet by vacuum.



The office is sending written orders to the shipping department. In a few seconds they are at the clerk's elbow as shown below.



The Lamson Junior Tube System can easily be used to connect all your offices. It will pay for itself in a short time.

Send your messages by tube

PNEUMATIC tube service is now within the reach of nearly every office and plant.

The new Lamson Junior Tube System carries messages and important papers safely and silently between offices and departments. It is amazingly easy to operate. Its keynote is speed.

With such a system, time required to transmit important letters and office records can be counted in seconds instead of in minutes as with messenger service. Written orders reach subordinates almost immediately. There are no delays because papers are lost. There are no misunderstandings due to verbal orders. Organizations are more closely knit together, and executives can organize their work so as to accomplish more in a day.

Wherever more complete tube systems would be too elaborate and costly, the Lamson Junior Tube System—*small, compact* and *portable*—can be put in or removed without trouble in a few hours and at a much lower cost.

A cabinet not much larger than a standard letter file contains the entire power unit. This cabinet is placed in position, the carrying tubes are attached to ceilings or walls, the "out" terminals put on any desks or tables—and the system is ready for use.

Nearly every office and factory can make use of a Lamson Junior Tube System. Let us help you plan one that will save you time and money. Get in touch with our nearest branch office, and one of our experienced sales engineers will call to tell you how you can best employ this system. If you prefer, send for special illustrated bulletin.

THE LAMSON COMPANY
SYRACUSE, NEW YORK
Branches Everywhere

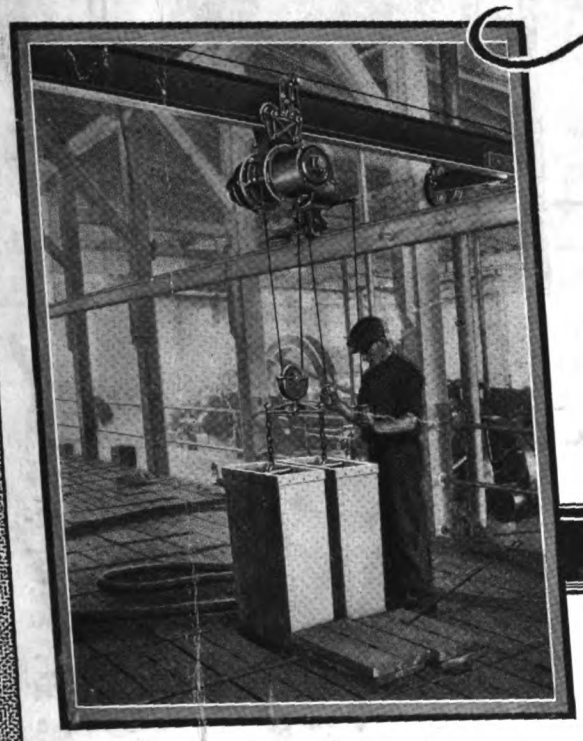
LAMSON SERVICE

Lamson Conveying Systems

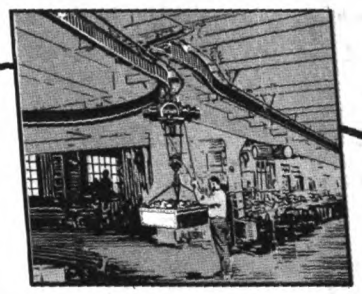
Digitized by Google

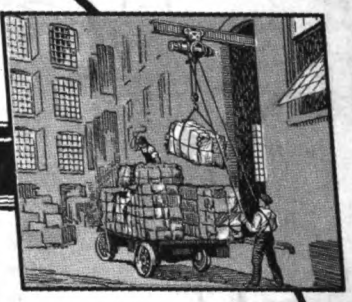
THE SHEPARD ELECTRIC LIFT ABOUT

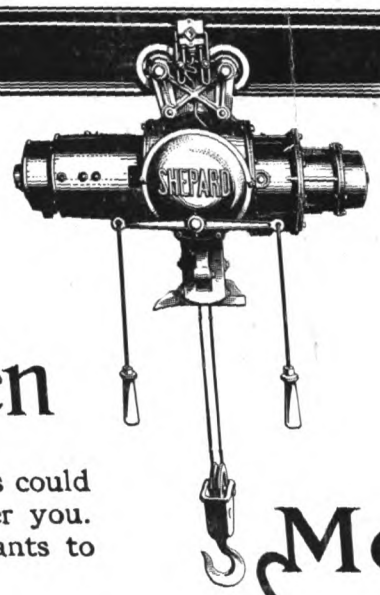
A new and smaller Electric Hoist

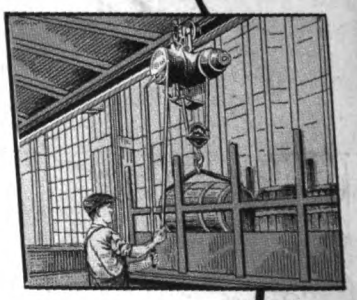


From ICE to









and a thousand uses in between

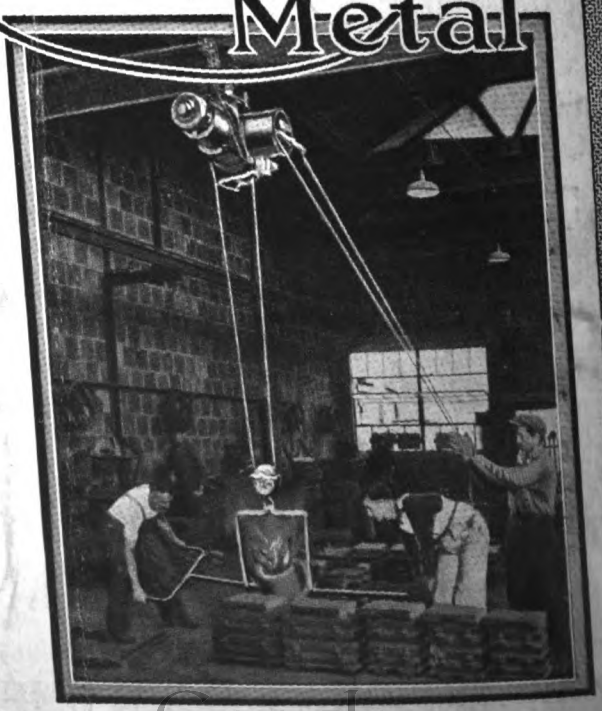
If you asked us what particular industry or business could best use a *LiftAbout*, we would be at a loss to answer you. It has proved to be a "hoist for everybody" who wants to move loads up to 1000 and 2000 pounds.

This wide application, together with the *LiftAbout's* demonstrated economy, leads us to recommend it for your load-moving and rehandling work.

If you will tell us what you wish to move, we feel sure that we can point out *LiftAbouts* which are steadily saving money in your line of work.

"Shepard" builds cranes in capacities to 30 tons, and is the largest producer of electric hoists in America.

Molten Metal



SHEPARD ELECTRIC CRANE & HOIST CO.

420 Schuyler Ave., Montour Falls, N. Y.

Branches in Principal Cities

Member Electric Hoist Manufacturers' Association

SHEPARD
REG. U.S. PAT. OFF.
ELECTRIC CRANES & HOISTS

Digitized by Google

JANUARY 1923

C. & A. R. R.

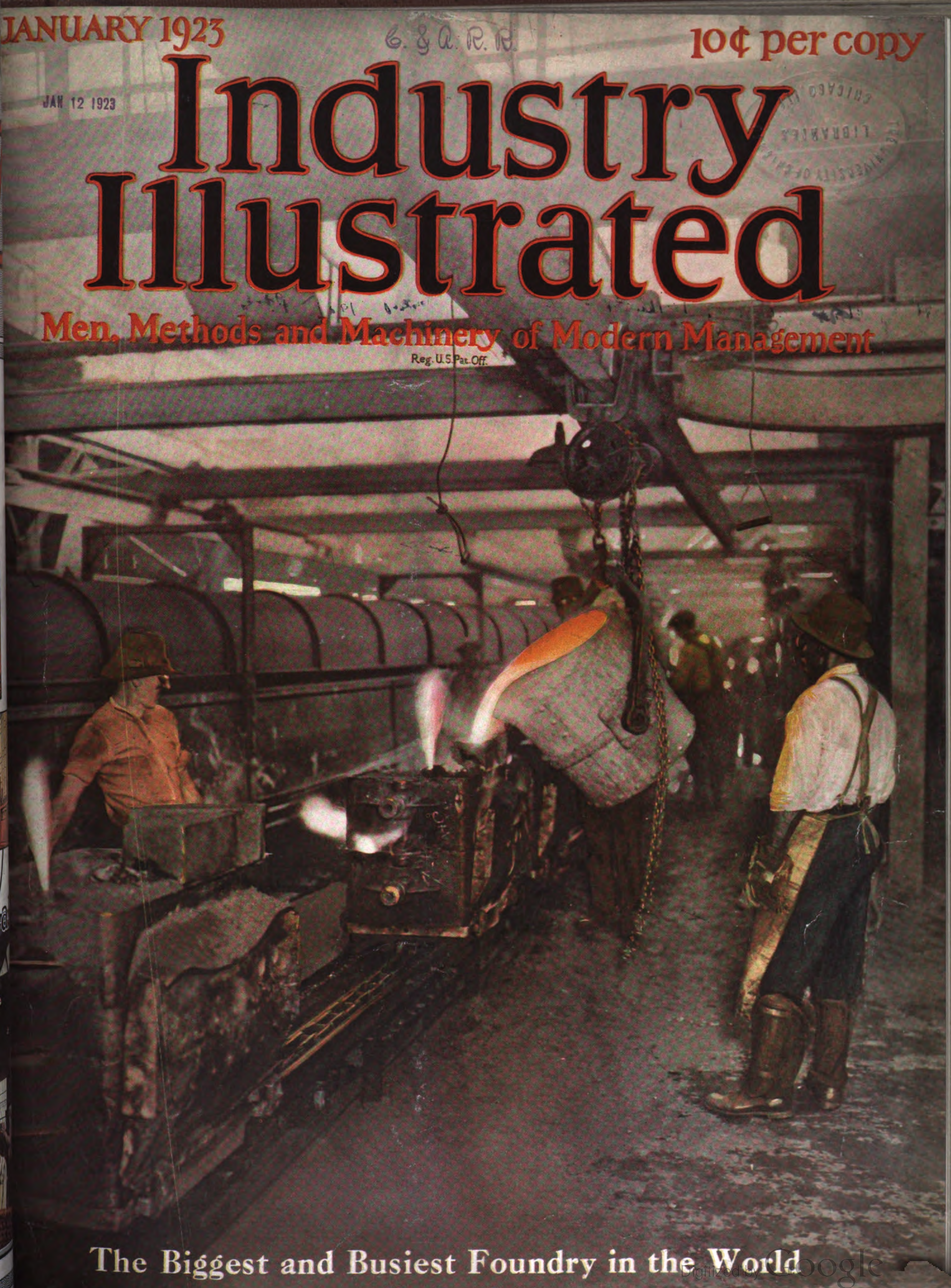
10¢ per copy

JAN 12 1923

Industry Illustrated

Men, Methods and Machinery of Modern Management

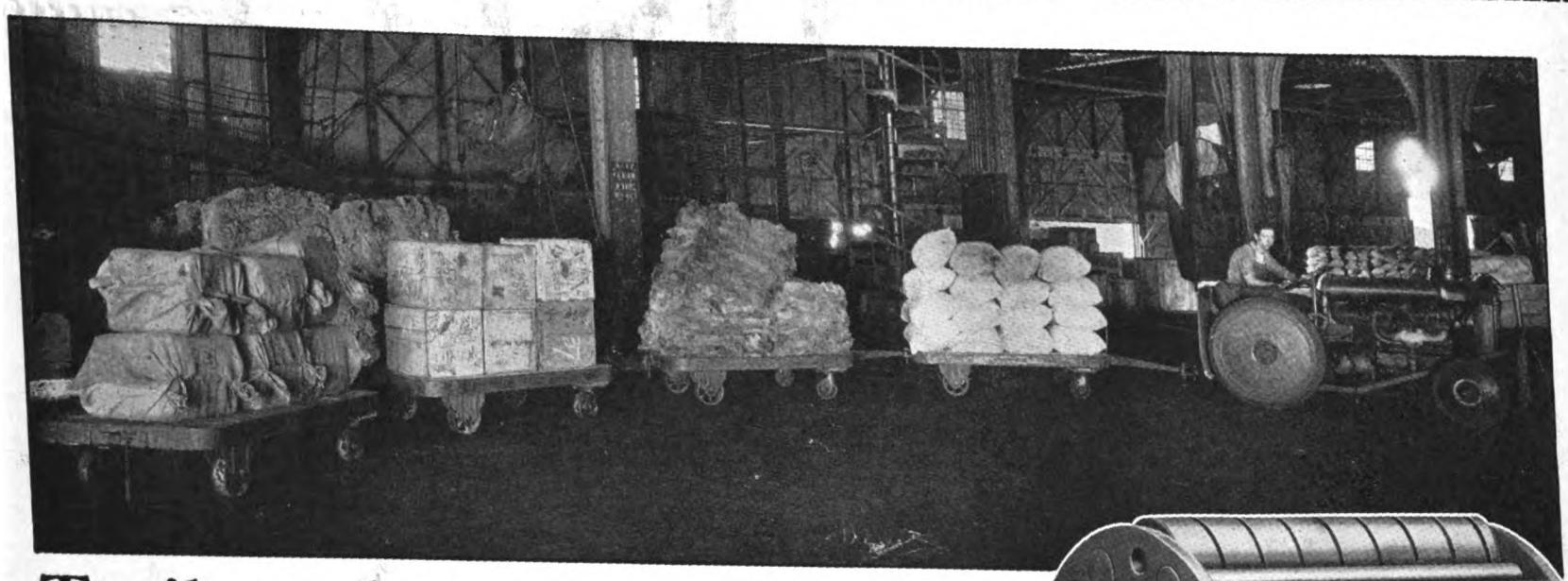
Reg. U.S. Pat. Off.



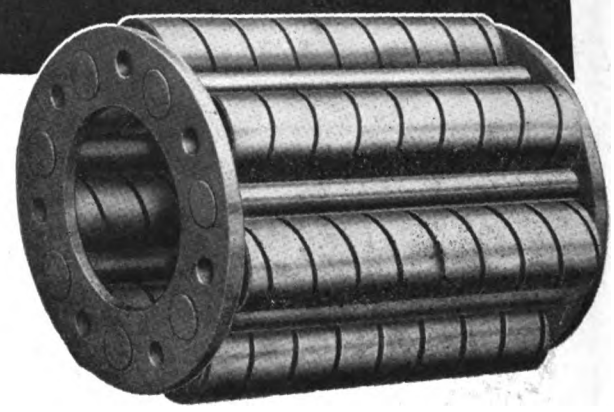
The Biggest and Busiest Foundry in the World

(See Page 60)

Digitized by Google



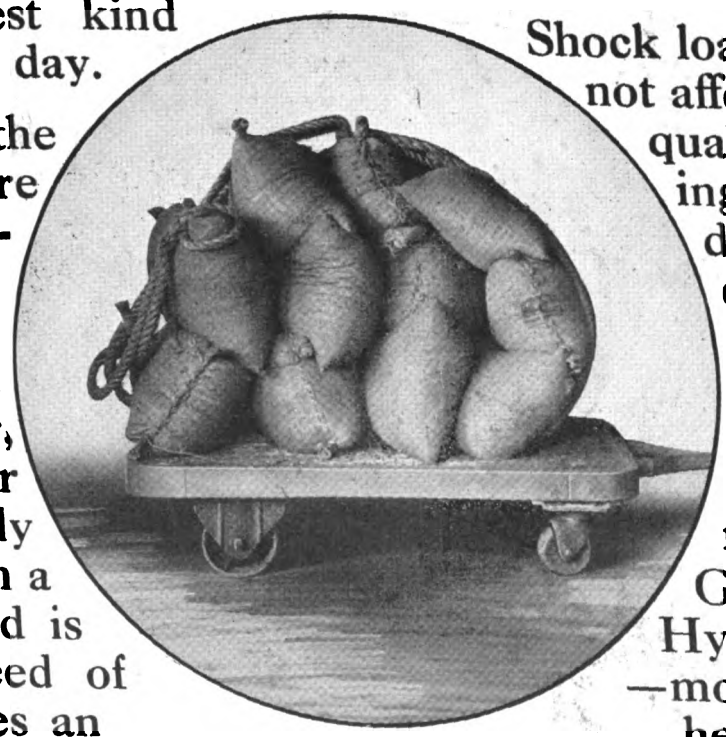
Trailers that stand the Bumps and Bangs of Roughest Service



The trailers used by the stevedoring firm of T. Hogan & Sons, Inc., on Pier 58 of the Atlantic Transport Line, New York Harbor, go through the roughest kind of service day after day.

Sling loads from the holds of vessels are dropped directly upon the trailers by the unloading derricks. Often the loads hit one end of the trailer, throwing the other end into the air, only to come down with a bang when the load is shifted. At a speed of seven to eight miles an hour, trains of nine trailers each make 900 feet hauls, hour after hour, day after day.

To stand up properly in service of this nature requires durably built trailers and the fifty "Brute" Hyatt bearing equipped trailers in use at this pier are giving real satisfaction.



One of the fifty Hyatt bearing trailers made by the Sharon Pressed Steel Company, Sharon, Pa., in successful operation at Pier 58 of the International Mercantile Marine Company, New York Harbor.

Shock loads and overloads do not affect the easy running qualities of Hyatt bearings nor cause them to deteriorate. They are capable of giving continuous good service throughout the life of the trailers without adjustment or replacement.

General advantages of Hyatt bearing trailers are —more trailers per train— heavier loads per trailer — no bearing replacements—addition of lubricant only 3 to 4 times a year, dependable, economical load handling.

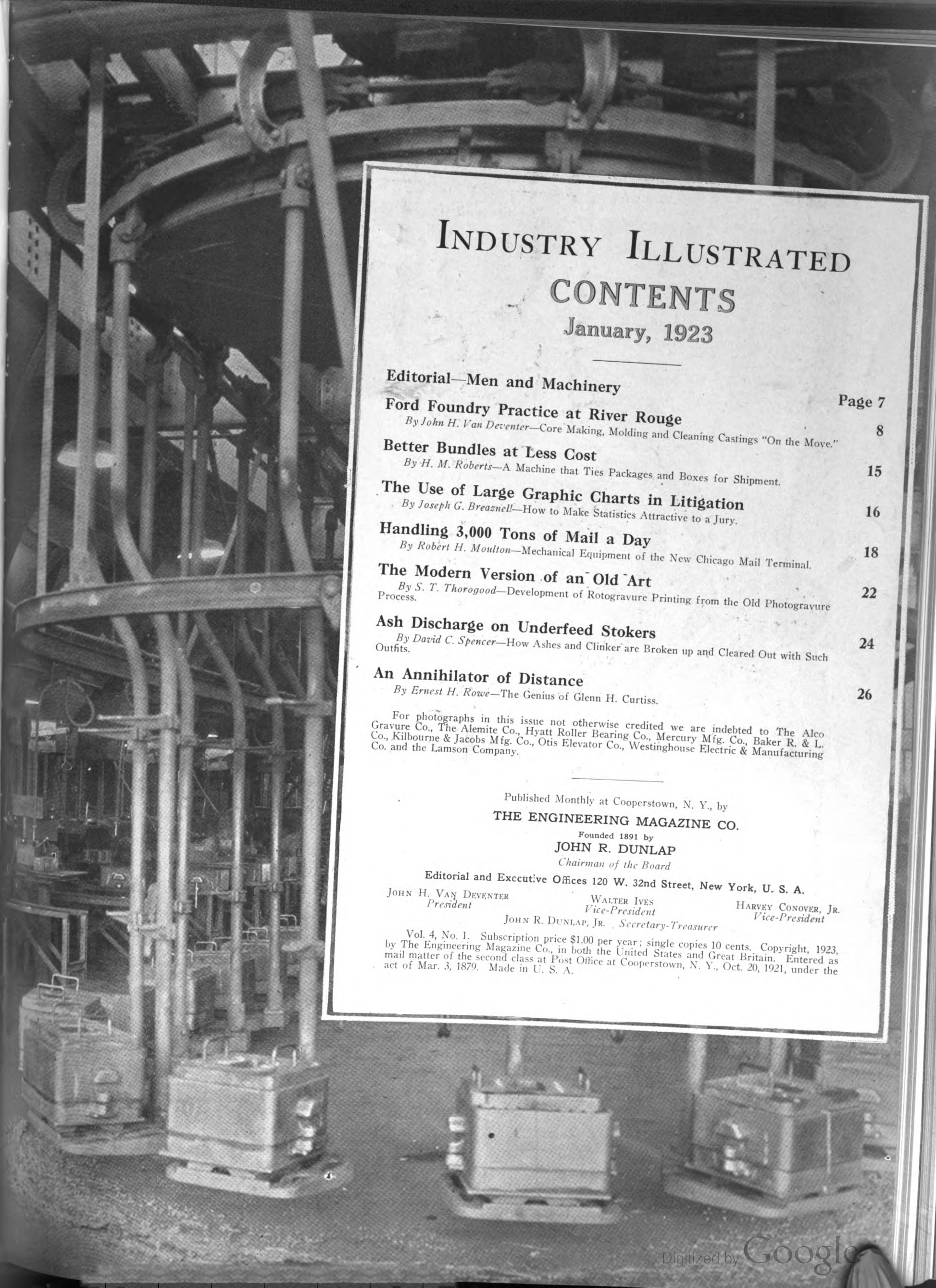
Specify that your trailers be Hyatt equipped, it pays.

Hyatt Roller Bearing Company

Worcester · Newark · Philadelphia · Pittsburgh
Detroit · Huntington · Cleveland · Indianapolis
Chicago · Milwaukee · St. Louis · San Francisco

USE HYATT BEARINGS ON YOUR LINE SHAFTS TOO BULLETIN 127

Digitized by Google



INDUSTRY ILLUSTRATED

CONTENTS

January, 1923

Editorial—Men and Machinery Page 7

Ford Foundry Practice at River Rouge 8
By John H. Van Deventer—Core Making, Molding and Cleaning Castings "On the Move."

Better Bundles at Less Cost 15
By H. M. Roberts—A Machine that Ties Packages and Boxes for Shipment.

The Use of Large Graphic Charts in Litigation 16
By Joseph G. Breaznell—How to Make Statistics Attractive to a Jury.

Handling 3,000 Tons of Mail a Day 18
By Robert H. Moulton—Mechanical Equipment of the New Chicago Mail Terminal.

The Modern Version of an Old Art 22
By S. T. Thorogood—Development of Rotogravure Printing from the Old Photogravure Process.

Ash Discharge on Underfeed Stokers 24
By David C. Spencer—How Ashes and Clinker are Broken up and Cleared Out with Such Outfits.

An Annihilator of Distance 26
By Ernest H. Rowe—The Genius of Glenn H. Curtiss.

For photographs in this issue not otherwise credited we are indebted to The Alco Gravure Co., The Alemite Co., Hyatt Roller Bearing Co., Mercury Mfg. Co., Baker R. & L. Co., Kilbourne & Jacobs Mfg. Co., Otis Elevator Co., Westinghouse Electric & Manufacturing Co. and the Lamson Company.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.

Founded 1891 by

JOHN R. DUNLAP

Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

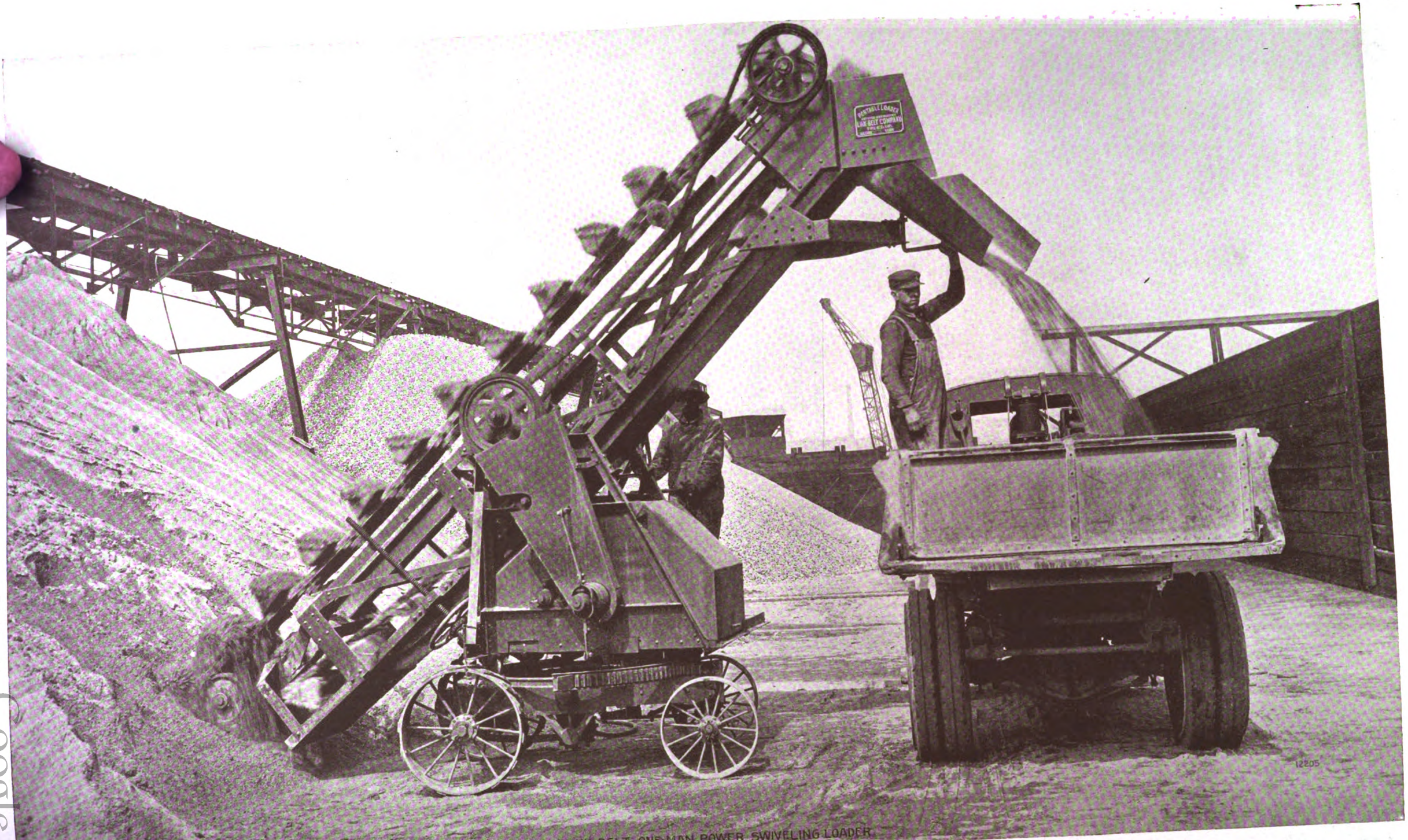
JOHN H. VAN DEVENTER, *President*
WALTER IVES, *Vice-President*
HARVEY CONOVER, JR., *Vice-President*
JOHN R. DUNLAP, JR., *Secretary-Treasurer*

Vol. 4, No. 1. Subscription price $1.00 per year; single copies 10 cents.

Copyright, 1923, by The Engineering Magazine Co., in both the United States and Great Britain.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google



LINK-BELT ONE-MAN POWER SWIVELING LOADER

DOESN'T this effective method of loading suggest a way to load some of your material? It makes labor more productive—cuts loading costs to the minimum; reduces loading to a simple, easy and pleasant job—regardless of the material handled.

Here is a real "one-man" machine—no other helper is required when loading any material that will flow. It is self-propelling, feeds from the piles, swivels and elevates all at one time, or it can accomplish any of these operations independently of the others—all at the will of the operator, conveniently located on the platform.

It is one of the standard Link-Belt Loaders described in the new Link-Belt Portable Loader Book No. 550, copies of which can be had on request to Link-Belt Company, Nicetown, Philadelphia, Pa.

Digitized by Google

Are YOU Included in this list?

If not—why not?

AN ARMY OF MEN in the industrial organizations listed below are fitting themselves, regardless of their past experience and education, to become efficient industrial executives.

THIRTY-FIVE PER CENT. of them are executives of large and small manufacturing companies. They are all enrolled for the "Factory Management Course" of study, provided by the Industrial Extension Institute.

American Can Co.
American Smelting & Refining Co.
American Tube & Stamping Co.
American Brass Co.
American Cotton Oil Co.
American Cyanamid Co.
American Glue Co.
American Lead Pencil Co.
American Machine & Foundry Co.
Ansonia Clock Co.
Anderson Electric Car Co.
Atlantic Refining Co.
Automobile Sprinkler Co. of America
Automatic Machine Co.
Buick Motor Car Co.
Bethlehem Steel Co.
Baltimore & Ohio Railroad Co.
Bethlehem Shipbuilding Corp.
Boston & Maine Railroad Co.
Bilton Machine Tool Co.
Carnegie Steel Co.
Cole Motor Car Co.
Canadian Tungsten Lamp Co.
Cambria Steel Co.
Cleveland Tractor Co.
Cluett Peabody Co.
Crane Co.
Champion Ignition Co.
Crocker, Wheeler Electric Co.
Cincinnati Milling Machine Co.
Coe-Stapley Mfg. Co.
Chevrolet Motor Car Co.
Du Pont Co.
Dodge Bros. Motor Corp.
Diamond Chain Co.
Dort Motor Car Co.
Edison Interests, Inc., Thos. A.
Earl & Wilson Collar Co.
Electro-Dynamic Co.
Erie R. R. Co.
Ford Motor Car Co.
Fiske Rubber Co.
Federal Motor Truck Corp.
Federal Shipbuilding Co.
Firestone Tire & Rubber Co.
Federal Signal Co.
Gair, Robert Co.
General Electric Co.
Gillette Safety Razor Co.
General Motors Corp.
Goodrich Rubber Co.
Goodyear Rubber Co.
General Phonograph Co.
Gould Manufacturing Co.
Hoover Suction Sweeper Co.
Hyatt Roller Bearing Co.
Hudson Motor Car Co.
Hendee Mfg. Co.
Howe Rubber Co.
International Money Machine Co.
International Motors Corp.
Johns Manville Co.
Kirkman & Sons.
Locomobile Co. of America.
Ludlow Valve Co.
Lincoln Motor Co.
Merchants Shipbuilding Corp.
Manhattan Electric Supply Co.
New Jersey Zinc Co.
New York Central Railroad Co.
National Blank Book Co.
National Conduit & Cable Co.
Noiseless Typewriter Co.
Ohio Machine Tool Co.
Packard Motor Co.
Pyrene Mfg. Co.
Patton Paint Co.
Paige Detroit Motor Car. Co.
Pan Motor Co.
Remington Cash Register Co.
Remington Typewriter Co.
Remy Electric Co.
Republic Motor Truck Co.
Rex Typewriter Co.
Robinson Clay Products Co.
Snaplock Co.
Standard Parts Co.
Surface Combustion Co.
Sprague Electric Co.
S. S. White Dental Co.
Singer Mfg. Co.
Standard Oil Co.
Timken Roller Bearing Co.
United States Steel Corp.
United Shoe Machine Co.
Union Bag & Paper Co.
U. S. Aluminum Co.
United Shirt & Collar Co.
Vulcan Roofing Co.
Westinghouse Elec. & Mfg. Co.
Ward Baking Co.
Weston Electrical Instrument Co.
Watervliet Arsenal, U. S.
Wright Martin Aircraft Co.
Western Electric Co.
Wolverine Motor Works
White Motor Co.
Willys-Overland Co.

THE Industrial Extension Institute specializes in training men in the principles and best practice of modern industrial management. It provides this training through a carefully planned course of home study, which you can pursue without interference with your work.

THE "Factory Management Course and Service" is the only course of its kind. It is based on the University plan of study, consisting of Lectures, Talks, Reading Assignments, Text Books, Problems and Modern Solutions, with the sole exception that the lectures, talks, etc., come to you in bound form, instead of being given orally. The Consulting Service, which is part of the course, is designed to help you in both your study of the principles of modern production management and in the application of them to your daily work.

WHETHER you are the president, general manager, superintendent, industrial engineer, cost accountant, store-keeper, inspector, or draftsman, the Industrial Extension Institute can help you to bigger things and greater happiness, by bringing to you the best principles and practice of modern industrial management and engineering, thru the "Factory Management Course and Service." The opportunity is yours. The demand for men with this training is far greater than the supply. Will you take advantage of it or be just where you are today—a year from now.

YOU at least owe it to yourself to look into this matter further. Fill out the coupon aud mail it today. The Institute will send you its 100 Page Book, "Thinking Beyond Your Job," which tells you all about the Course and Service.

Mail This Coupon—*Now!*

Industrial Extension Institute
Nine East 45th Street
New York City

Gentlemen:—

Send me without obligation your 100 Page book "Thinking Beyond Your Job."

Name .....
Home Address .....
Position .....
Company .....
Co. Address .....

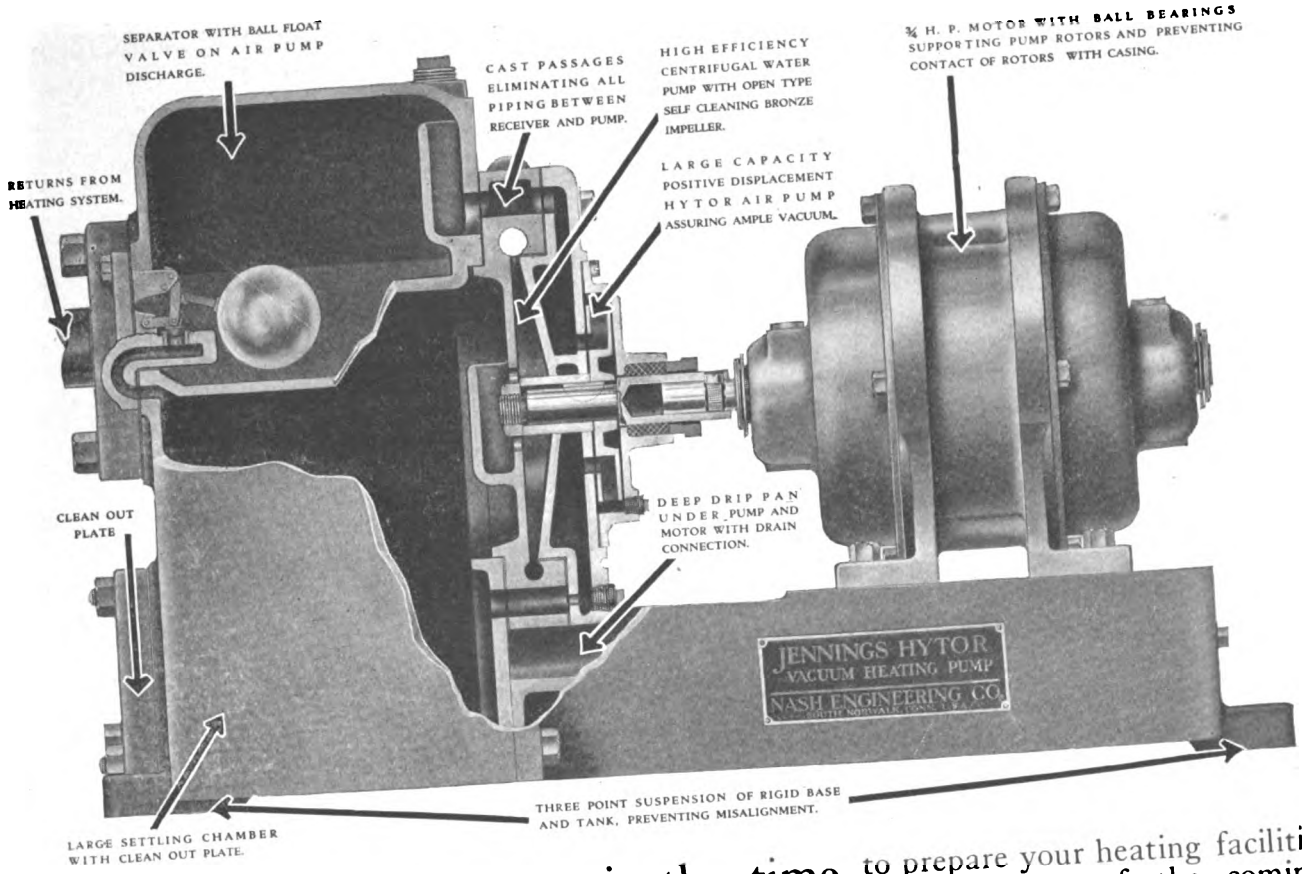
Ind. Ill. 1-23

The Only Complete Course in Industrial Management

Digitized by Google

THE COAL SITUATION DEMANDS EFFICIENT HEATING

EFFICIENT HEATING DEMANDS THE JENNINGS PUMP



Now is the time to prepare your heating facilities to meet the conditions of the coming winter.

The installation of a Jennings Return Line Pump in connection with your system means quick heat in the morning, at the most isolated radiators, and in zero weather. It means a positive control of heat at all times and the elimination of radiator noises. It means an economy in fuel, that, according to our customers, makes this piece of equipment a real dividend paying proposition.

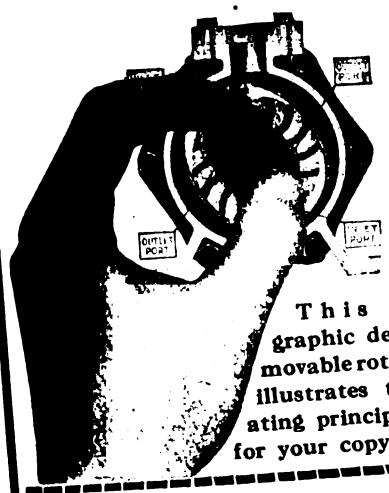
Jennings Pumps are made for any size installation. The small unit here illustrated has ample capacity of 5,000 sq. ft. of equivalent direct radiation. Because of simplified design, in connection with quantity production, this outfit is being sold at a price never before possible in a pump of this capacity.

The pump incorporates all of the high grade workmanship and material characteristic of our Jennings equipment. It is equipped with solid bronze air rotor, rotor housing, water impeller and shaft.

In this unit all piping complications have been removed, and it is only necessary to make three connections:
1. The return main. 2. The water discharge. 3. The air discharge.

While the new compact "M" type is furnished in one size, our well known Jennings Pumps in separate tank design, as recommended for larger capacities, are furnished for any size installation.

Many thousands of these pumps have been installed and have given universal satisfaction.



This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

10

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps
- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps

NAME .....
POSITION .....
COMPANY .....
ADDRESS .....

NASH ENGINEERING CO.
SO. NORWALK, CONN. U. S. A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

Men and Machinery

THE history of mankind is known definitely for a period comprising a few thousand years only, and much of what the history of mankind has been during this period is obscure. Some of this obscurity has been removed by the discovery from time to time of historical records and keys to their interpretation, while geology has revealed some information regarding the conditions that prevailed during past ages and monuments of varied nature have endured as visible testimony of the constructive ability of man and his efforts to progress.

To succeed in his struggle for existence, primitive man's first need was for some physical means of supplementing the strength of his body and we may believe that his reasoning mind caused him to carry and use a club as a weapon of defense. Further reasoning convinced man that this tool also could be used to kill and that it supplemented his bodily strength to such an extent that he could not only protect himself against larger animals but he could provide himself with food thereby. Additional thought suggested the spear and the bow and, later, such means of moving heavy masses as the lever, the roller, the wheel and axle.

Man had discovered the supplemental use of tools! His inventive faculty developed. He devised more tools and used them in constructive work. He developed these tools and multiplied their uses until his civilization had become sufficient to enable him to build the pyramids, which have endured to this day and will endure for days to come. His was the influence of mind over matter and all that he accomplished thereby was supplemental to his mind and to his bodily strength.

The result of this development has been that modern man has a multiplicity of machines at his command that operate with greater precision than man himself can operate, that do an amount of work that men in great number could not do manually, and that enable man to manufacture, transport and distribute to the ends of the earth, the products of man's inventive genius for the benefit of other men.

But, all this machinery is at man's *command*. Every piece and part of it is subservient. Of what use would be the most necessary of all of man's machines without some human being to start it, supervise its operation, stop it and maintain its effectiveness? It would be of no use whatever. Hence, no machine can supplant the men who build it and operate it.

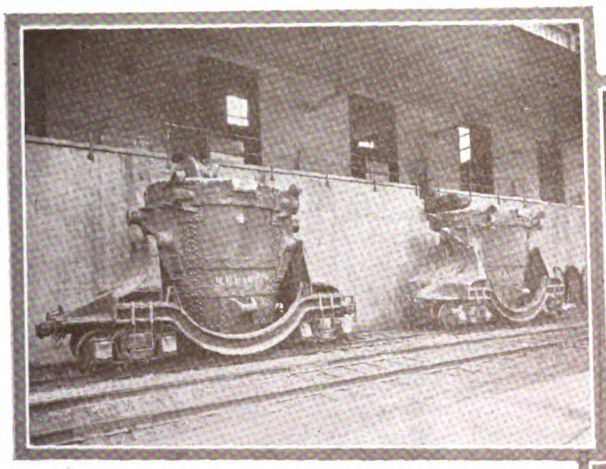
To the shallow minded it may appear that machinery production has superseded manual production but, to those whose thought runs deeper, it is very evident that, now as always, machinery is entirely secondary and deserves only secondary consideration to that of man himself. The way in which to utilize machinery to a maximum extent is to give first consideration to the men who design, build, operate and maintain the machines.

Digitized by Google

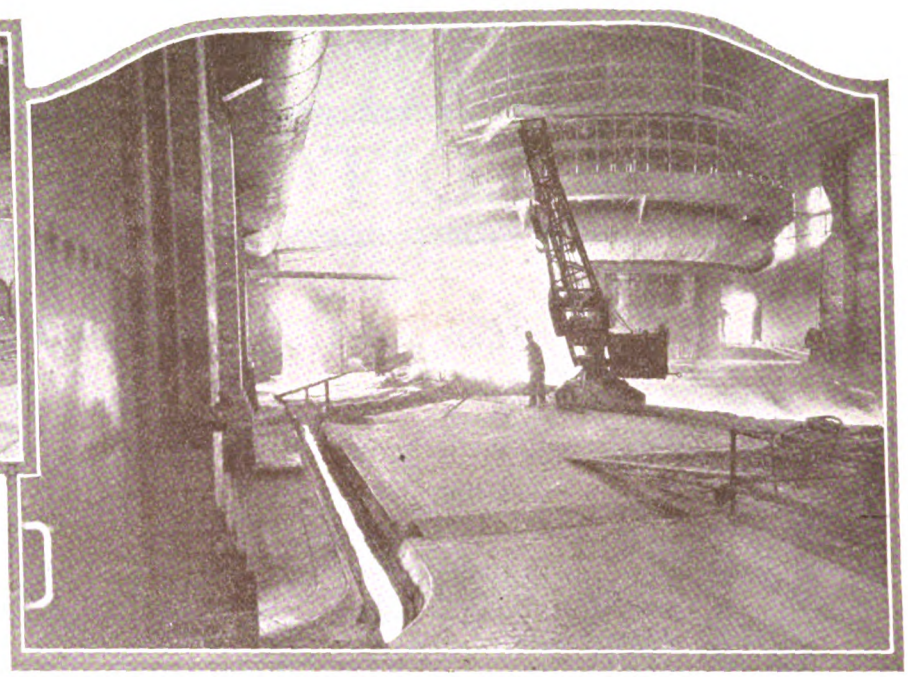
Ford Foundry Practice

Core Making, Molding and Cleaning

By John H.



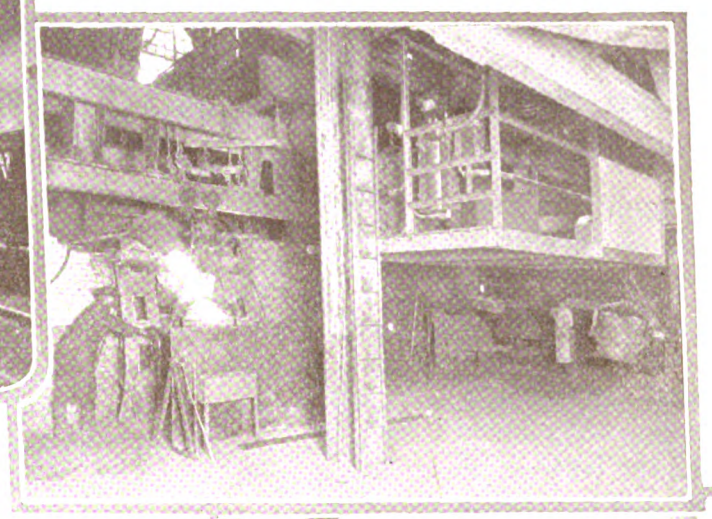
2—These huge 80-ton ladles are filled with the molten blast furnace metal. Then they are switched by locomotive to the foundry building.



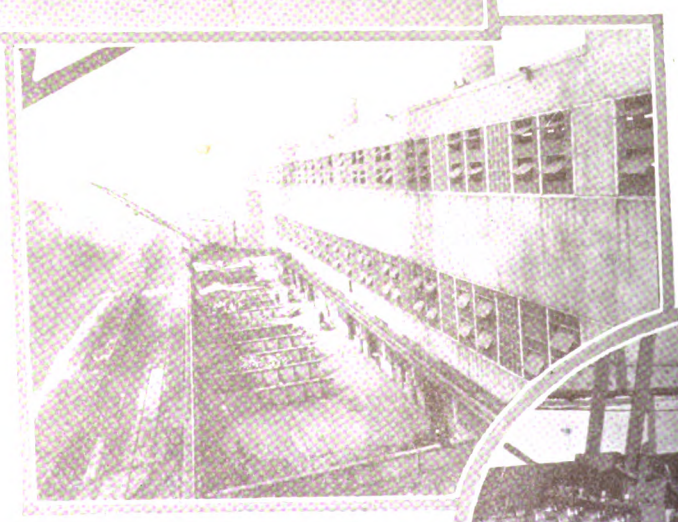
1—This molten stream of metal flowing from the blast furnace is destined to be directly poured, without remelting, into Ford car and tractor castings.



4—The hot metal containers are huge cylindrical tanks lined with fire clay and pivoted on trunnions. By tipping up the rear end of the container the operator in the cage at the right of this picture pours the metal.



3—Here is one of the 80-ton ladles of molten blast furnace metal "spotted" under a 125-ton Gantry crane at the foundry. This crane pours the blast furnace metal as required into a transfer ladle which serves hot metal containers inside the building.



5—While most of the pig metal used at the Ford foundry comes direct from the blast furnaces, the twenty-four foundry cupolas are nevertheless kept busy, melting scrap and "back stock." This shows a view of the stock and scrap gallery just outside of the charging floor.



6—There are six batteries of four cupolas running through three mezzanine floors. Limestone and coke come to the foundry on conveyor belt and are stored in the bins shown at the top of this picture.

THERE is a certain universal fascination to the technical and non-technical man alike, in watching the pouring of molten metal. There is a similar fascination in watching the movements of a smooth-running ingenious machine. The Ford foundry at River Rouge is doubly fascinating to the visitor because, in addition to its being the biggest and busiest foundry in the world, one sees here almost incessant streams of molten iron, aggregating *fifteen hundred tons each twenty-four hours,* and because the entire foundry with its conveyors, molding systems, elevators, and other methods of mechanical transportation, is in real-

7—Chips from the machine shop are remelted by baling them in "stove pipes." A special sheet metal working department is located on the charging floor, to make these containers.



Digitized by Google

at River Rouge

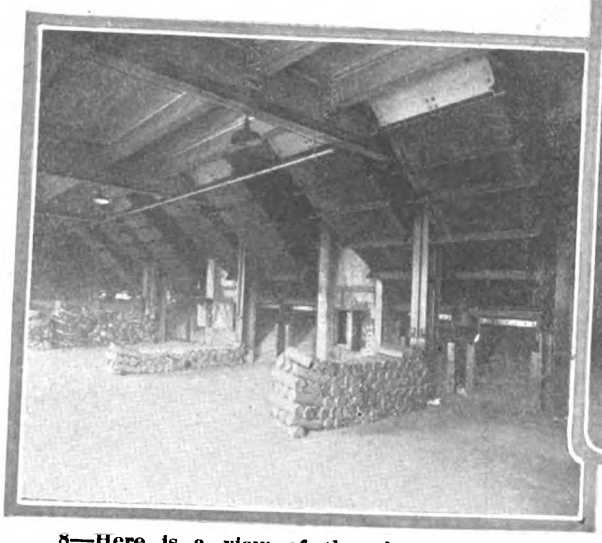
Castings "On the Move"

VAN DEVENTER

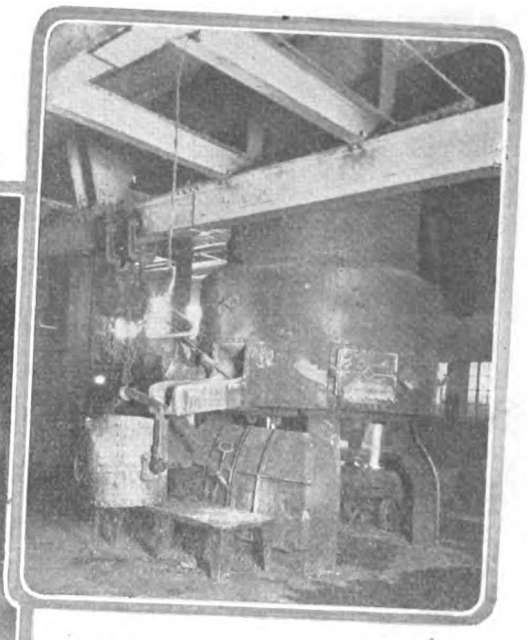
ity one huge, smooth-running, highly ingenious machine.

River Rouge is unlike any foundry that the reader is likely to have visited. Its keynote is *transportation* and *continuous operation,* which two things go together as cause and effect. Men, molding machines, core ovens, tumbling barrels, and ladles of molten metal are welded together through engineering skill into one elaborate mechanism in which the machinery takes the footsteps and the men stand still.

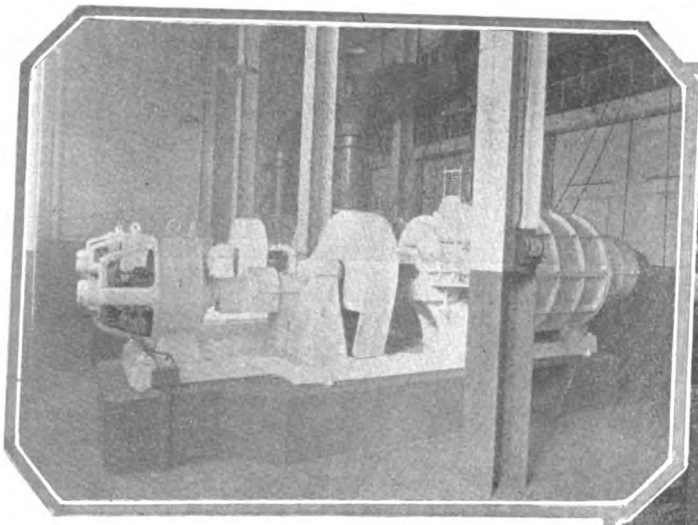
Along the twelve hundred-foot wing which comprises the backbone of the foundry building are situated twenty-four huge cupolas, any one of which would be sufficient to serve the purposes of a foundry of average size. There is no waiting to "pour" in this foundry until three or four o'clock in the afternoon for the molding floors to become filled with molds—for there are no molding floors. The blast is "on" twenty-four hours a day and every two or three minutes one or more of the twenty-four cupolas is spilling its white hot molten metal into one-ton ladles suspended by trolley and chain hoist from monorails above. This picture is the first that is painted upon the observing mind of the visitor to



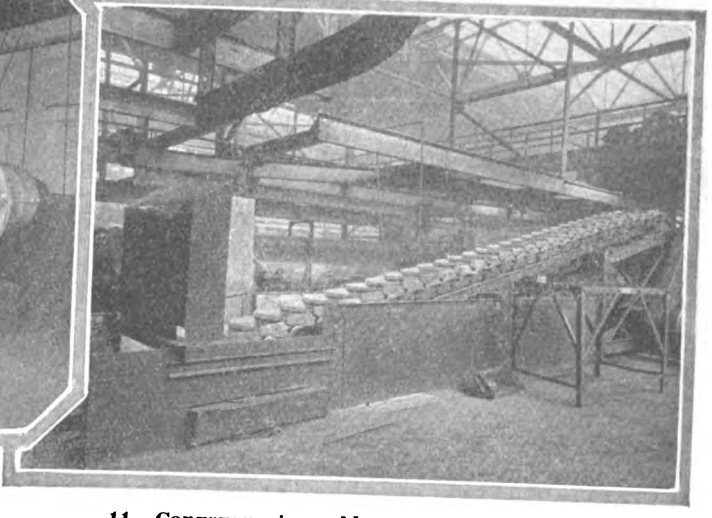
8—Here is a view of the charging floor showing chip containers and also the chutes through which coke, limestone and "back stock" are introduced into the cupola.



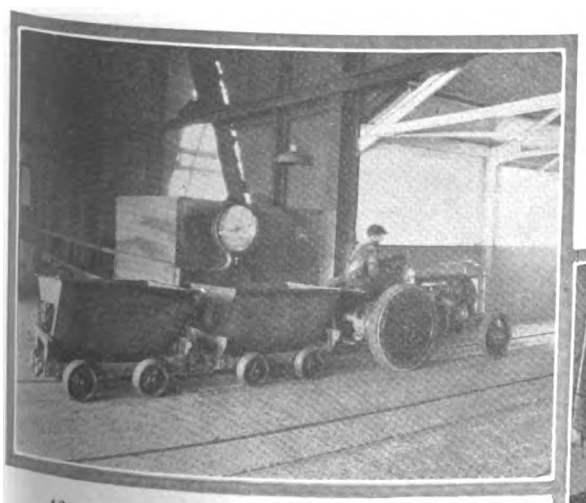
9—View of a cupola on the ground floor level. Twelve-inch monorails carry the one-ton hot metal ladles to the pouring stations along the quarter-mile foundry front.



10—Blast for the cupolas is provided by means of positive pressure blowers housed in six blower rooms.

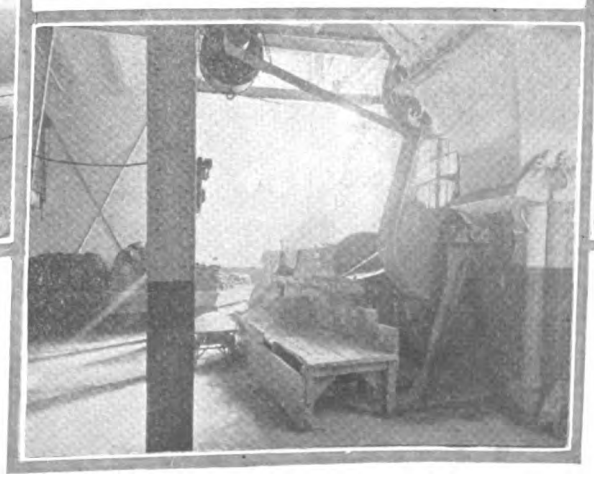


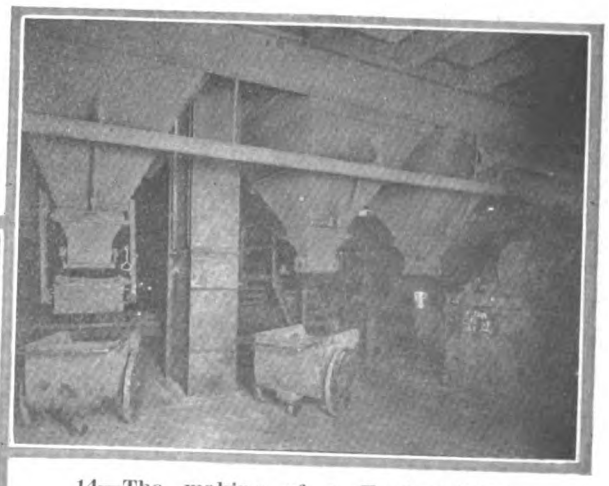
11—Conveyor pig molds are stationed near each cupola battery. In these molds the metal, too cold for pouring into molds, is pigged.



12—Foundry scrap or back stock is transported in tip cars drawn by special Fordson tractors and weighed as shown above.

13—Fire clay for daubing the ladles is mixed in special machines such as shown above, which shows the interior of a ladle daubing room.





14—The making of a Ford cylinder starts with the making of its cores. Core sand prepared in screening and mixing machines is stored in the bins shown above and dropped as required into the core sand wagons.

Digitized by Google



15—The wagons of core sand are wheeled upon galleries which extend over the core ramming tables and the sand dumped into the opening shown at the left and right of this picture.

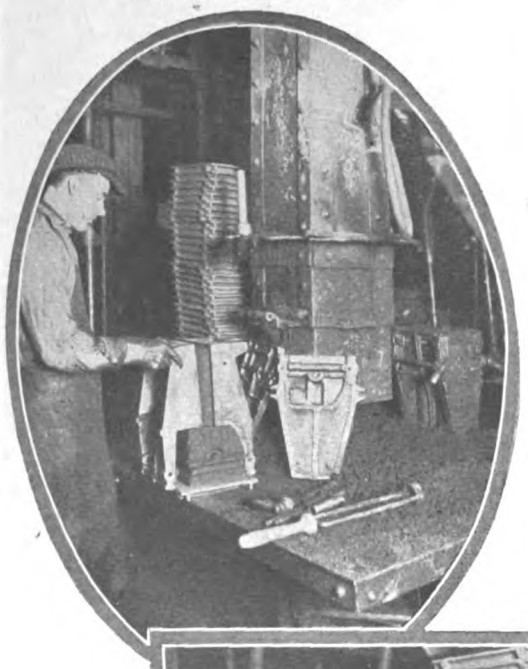


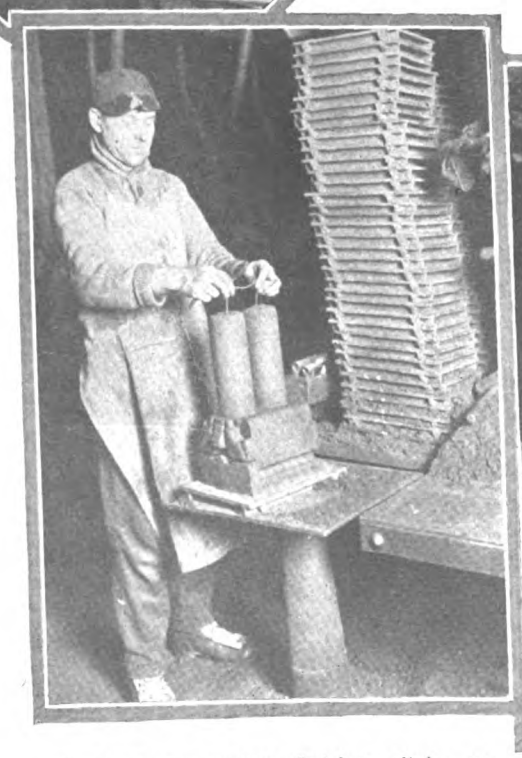
17—This shows the first step in making a typical Ford core, namely the cylinder body core. Notice the four-part metal core box at the right.



16—From the core sand gallery, spouts lead down to the ramming tables shown at the left. At the right is a pendulum core conveyor for carrying the finished cores to the ovens.

18—After the core has been rammed the box is turned upside down and taken apart.





19—Next an expert finisher slicks up the core and places supporting wires.



20—Then the finished green core is lifted and placed upon one of the shelves of the pendulum core conveyor.

the River Rouge foundry, and he wonders first how molds enough can be made to dispose of such an enormous quantity of metal, and next how all of these filled ladles in their journeys from pouring stations to cupolas can be kept out of traffic jams.

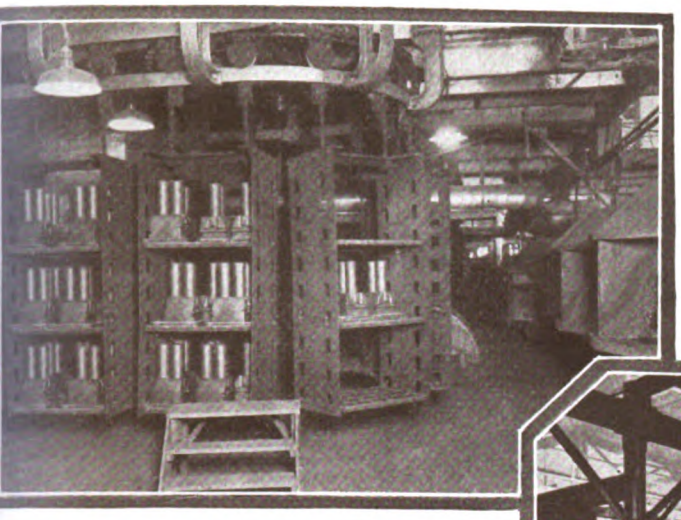
The answer is simple. Everything moves at River Rouge and moves over *predetermined routes* without interference. The ladles of hot metal are skillfully switched to their destinations by means of a double track system of monorails and numerous crossover switches. Just at the very moment one anticipates a collision between two ladles a switch is skillfully thrown and they come to a definite parting of the ways. As for the molds they are arriving on conveyors, so many per minute with almost mathematical precision, all day long at the pouring stations adjacent to the cupolas.

The cupolas at River Rouge, many and large as they are,

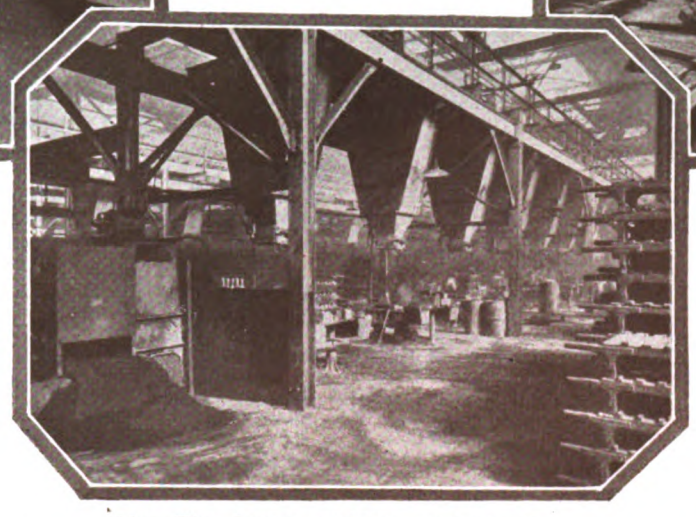
21—The pendulum core conveyor carries the green core to a spray hood where it is sprayed by compressed air with core wash.



Digitized by Google



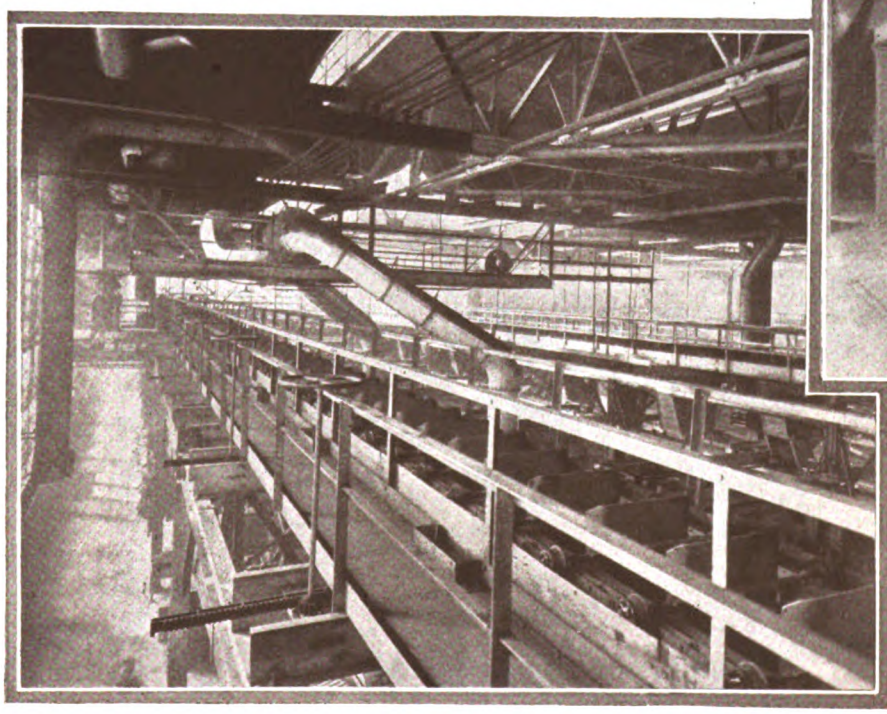
22—Next it is placed on a shelf of one of the cabinets of the core oven conveyor to be baked during its two-hour journey through the ovens.



23a—The heavy molding systems are triple lines of floor conveyors 288 feet long. On either side of each system are batteries of molding machines served with sand from overhead galleries.

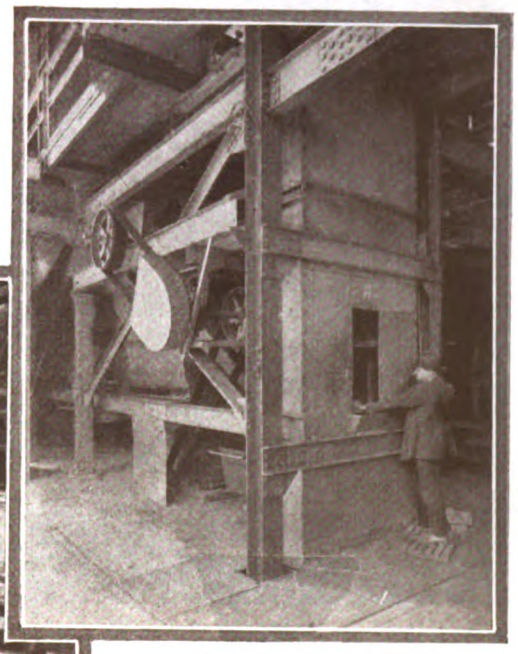


23—Emerging from the ovens the finished cores are placed upon longitudinal conveyors which carry them to storage racks adjacent to the molding systems.

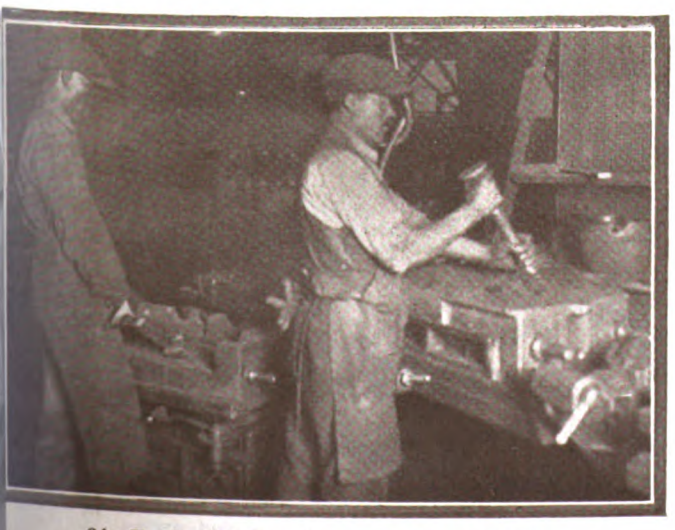


23b—Before the molding sand goes to the gallery it is put through a screening and cutting machine such as shown above. The greater part of this sand is reclaimed through conveyors below the floor from the flask shakeout stations.

23c—Conveyors carry the reclaimed sand along the sand gallery, depositing it in the bins over the molding machines.



o not represent the primary eans of melting the metal for astings. It is in the blast rnaces in an adjoining build-g that the ore coming from e Ford mines is smelted with ke from the Ford coke ovens, d reduced to molten metal at e rate of a thousand tons ch twenty-four hours. This etal is transported to the undry by means of huge ghty-ton ladles, pulled by comotives and tipped by ge cranes, being finally re-ived in thirty-ton clay lined ting "tea pots," three of ese hot metal containers be-g interspersed with the cu-las and tipping their fiery ntents into each partially led ladle of cupola metal. he cupolas in fact are in-nded to take care largely of e "remelt"—the back stock, rap, sprues, risers, and shop turns. "Why," asked the ord engineers, "should it be cessary to let blast furnace etal first cool into pigs and en go to the expense of melt-g it again?" And so in spite

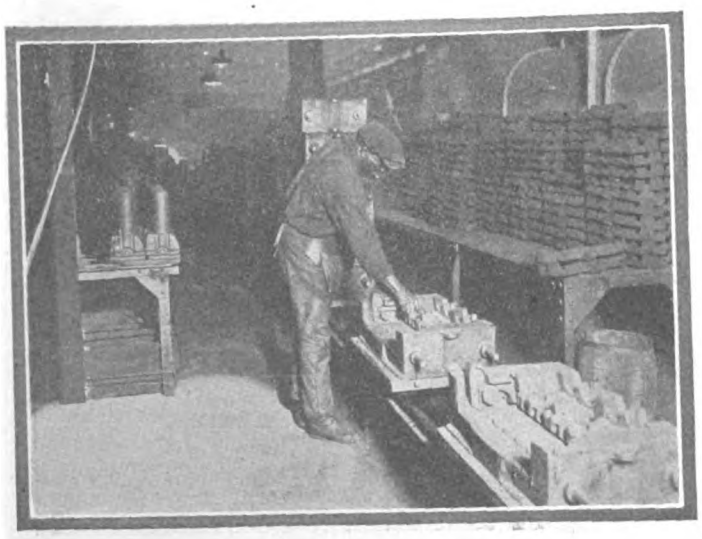


24—Ford cylinder drags are rammed on rollover pattern-draw machines, such as shown above. Then the "drags" or lower halves of the molds are placed upon the conveyor system.

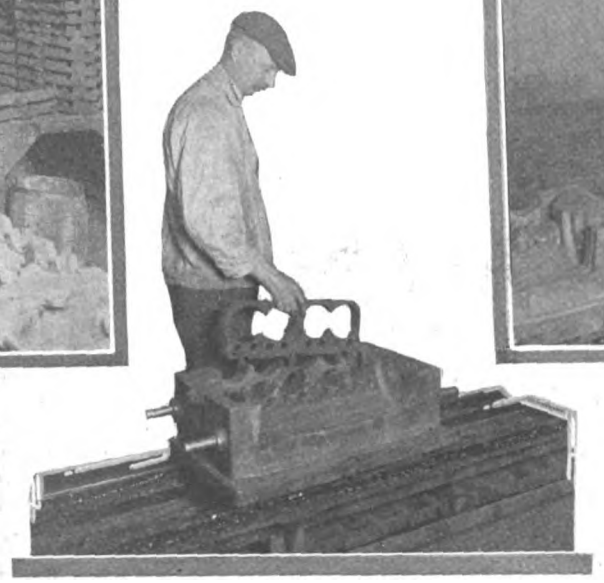


25—As the molds proceed on this journey, they pass various operators who place housing, port, water jacket, gear case and other cores.

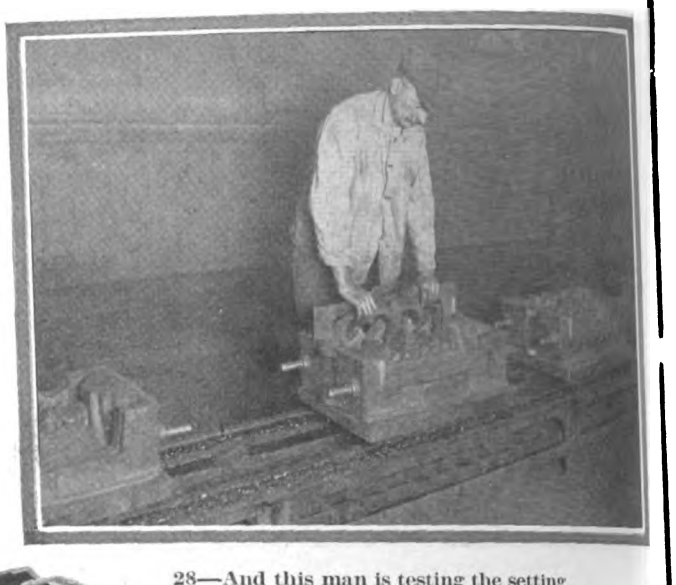
Digitized by Google



26—Each operator has a certain duty to perform and does that one thing only, doing it with maximum efficiency.



27—This man for example, is placing the water jacket core in position.



28—And this man is testing the setting of the water jacket core by means of a templet which fits the core.

of precedent and practice, which said that it was impossible to secure light, thin-sections, machinable, high-silicon castings without such remelting, the fiat went forth "it must be done." And it *was* and *is* being done! Just how is told in the pictures.

Except for some of the brass and aluminum work and the minor amount of jobbing work which is done at this foundry (for shop repairs), there are no molding floors such as one is accustomed to see in the usual foundry. As far as the wood block floors themselves are concerned, they are as clean as the floors of an average machine shop—not littered inches deep with molding sand. For the sand is personally conducted to its destination—the flask—by means of conveyors and strategically placed delivery spouts, so that it goes where it is intended to go, namely, into the flask instead of upon the floor. But more about this sand transportation later.



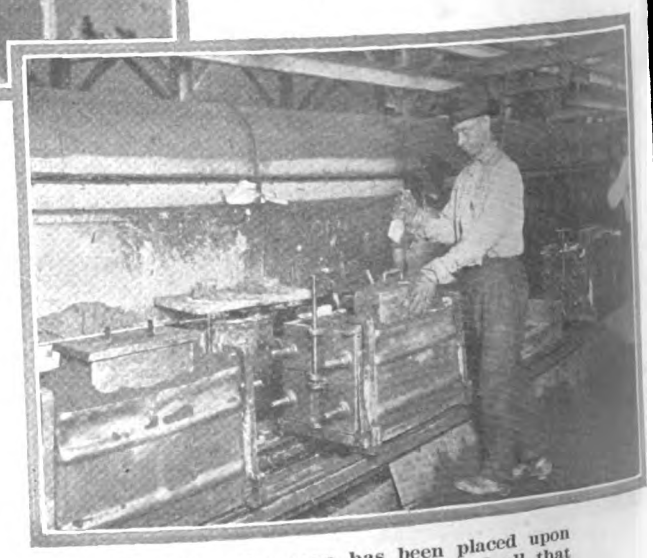
30—After the cores have all been placed their setting is tested by means of a metal templet as shown below.

29—Here the cylinder body cores are being placed, two of them to a mold, forming four cylinders.



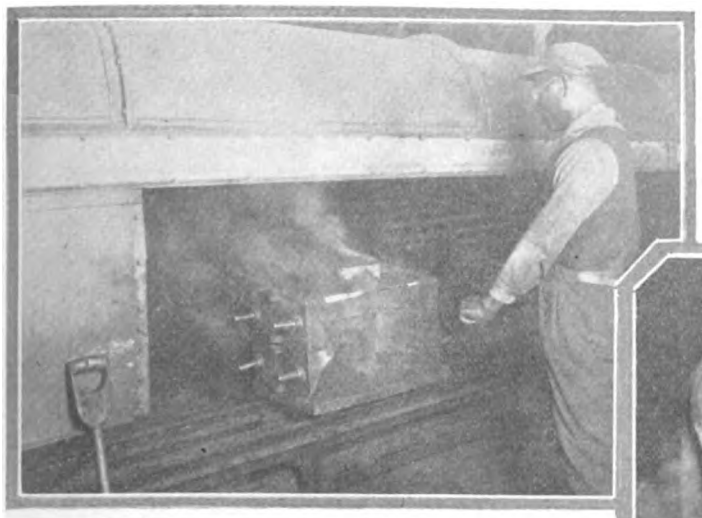


31—The copes, or top halves of the cylinder molds, are rammed on special stripping plate machines.



32—After the cope has been placed upon the drag the mold is closed, and all that remains is to ram up the back plate and the runner box through which the metal is to be poured.

Digitized by Google



33—By the time that the poured mold has traveled some 200 feet under an exhaust hood on the cooling line it has solidified. As it emerges from the hood an operator knocks off the runner block.

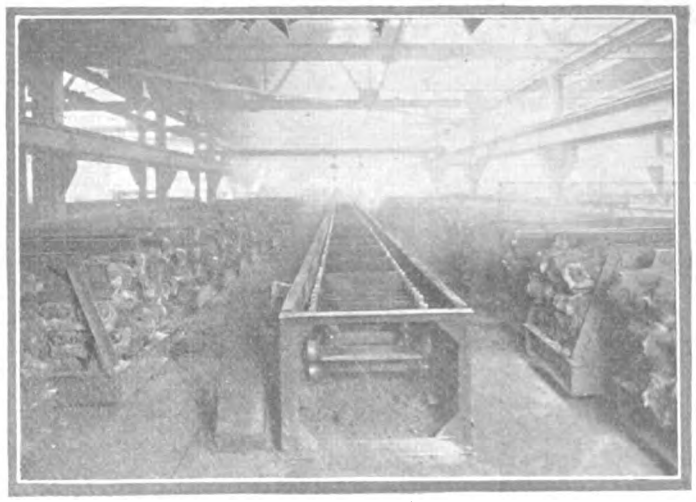


35—The red hot castings are snatched from the drags by means of ice tongs and are swung over to the hot casting conveyors to begin their journey to the cleaning mezzanine.

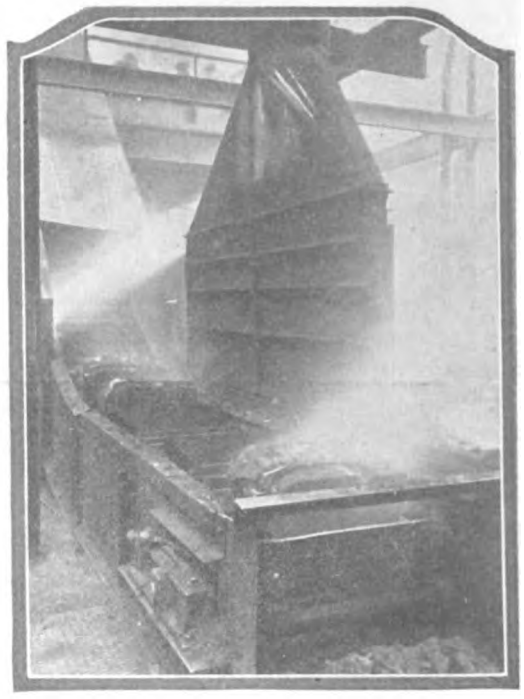


34—At the extreme end of the cooling or return line are the shakeout gratings. As the flasks reach these they are broken open.

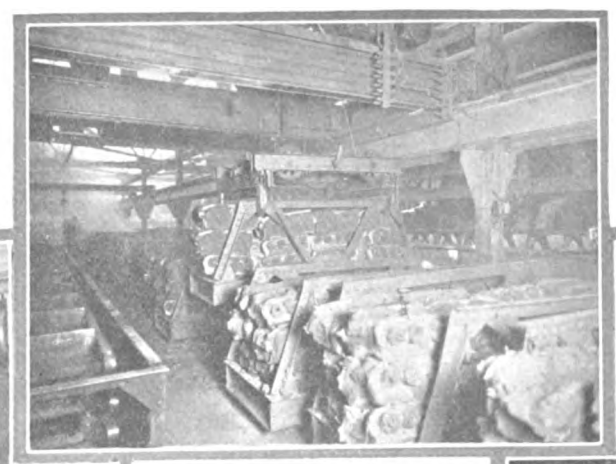
Stretching away into the distance as one looks from the cupola front, are the molding systems or conveyors on which the evolution of the molds takes place. One-half of the space in the foundry devoted to molding is confined to heavy castings, such as cylinder block and tractor transmission frames. As one stands near the cupolas and looks toward the terminus of one of the six heavy casting "systems" he sees—back of the tipping ladles at the pouring station—a three-hundred-foot perspective of men, molding machines and growing molds. On either side of each one of these duplex, or rather triplex, systems, chain drag conveyors facilitate the journey of the ever-growing molds from the first stage in which the drag half of the flask is rammed, to the final stage of the "up" journey at the pouring stations. Between these two active outer lines, both moving in the same direction, is the return line, hidden by a smoke hood under which the liquid cylinders and



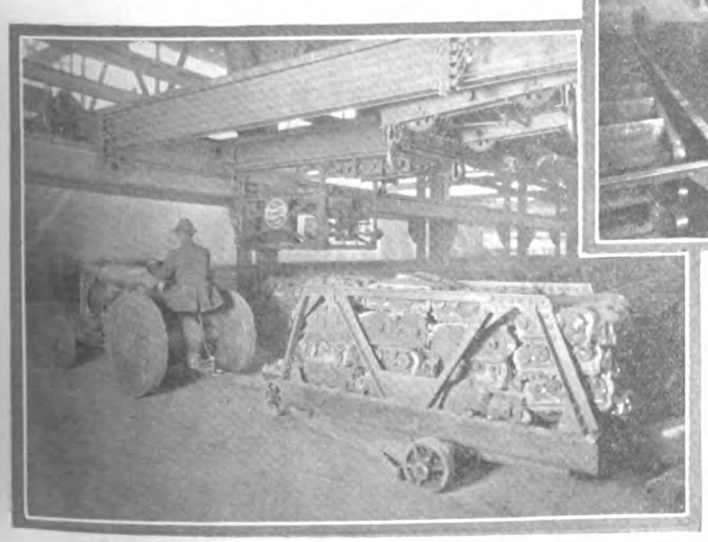
37—On the mezzanine the cylinder castings are swung from the hot casting conveyor into cooling racks and allowed to cool for about four hours.



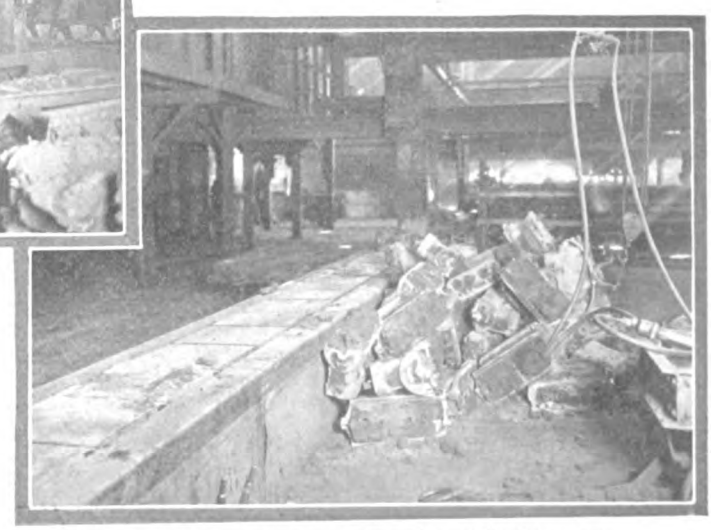
36—This shows the receiving end of one of the hot casting conveyors which terminates on the mezzanine.



38—Then the racks are picked up by crane and carried out to a mezzanine gangway.

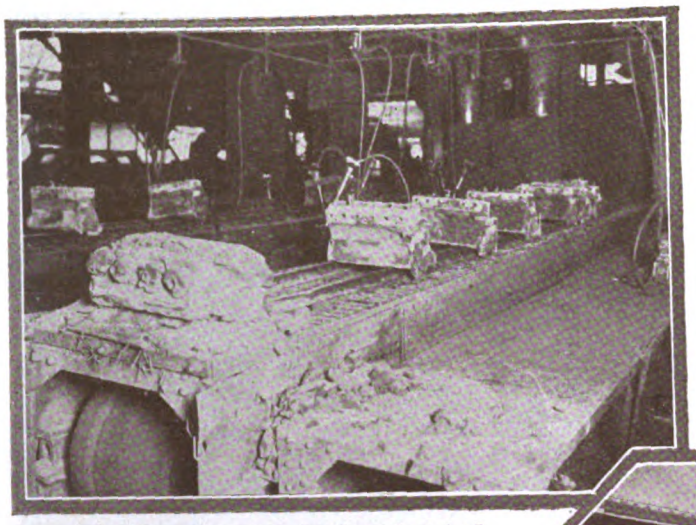


39—Next they are dropped upon lift trucks and drawn by Fordson tractors to the cleaning station.

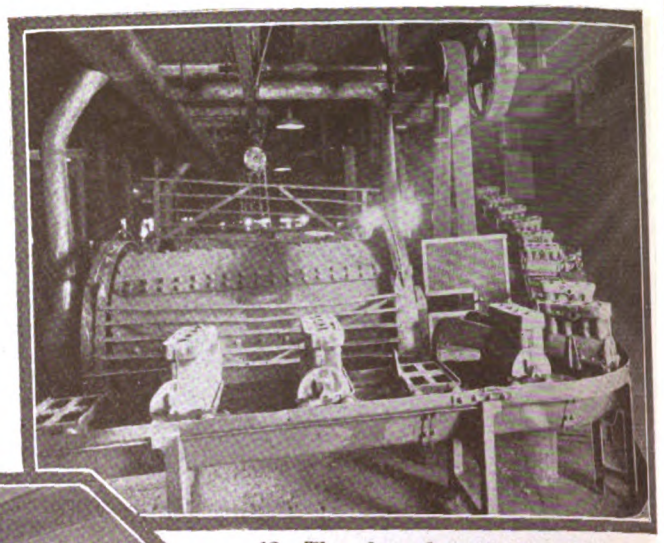


40—At the cleaning station the cylinders are placed upon moving platforms where the rods and vent tubes are removed and the heavy chipping operations are performed.

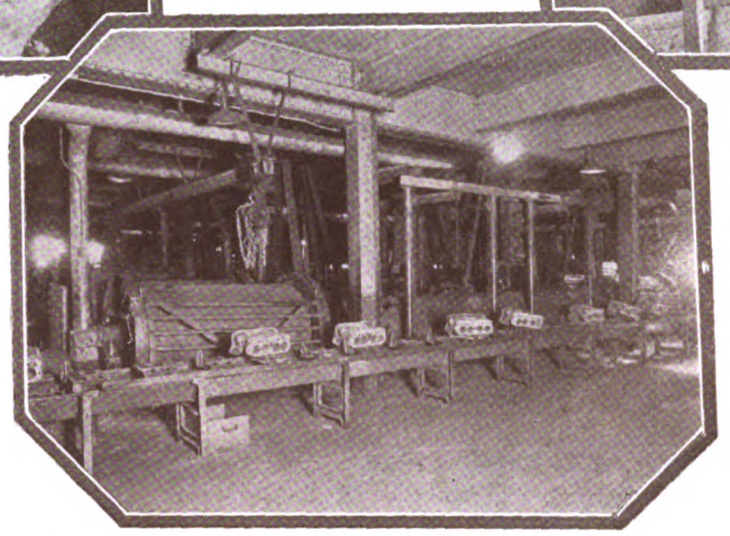
Digitized by Google



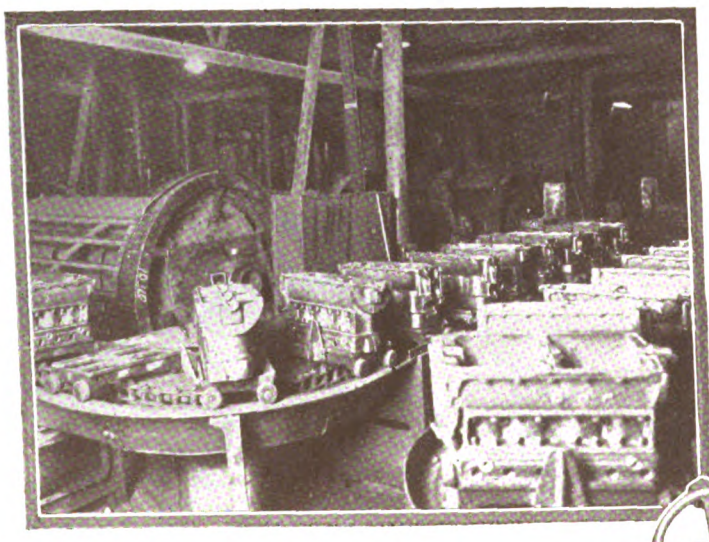
41—Then the core sand is knocked through the gratings shown above to be carried by conveyor to the sand reclaiming machines.



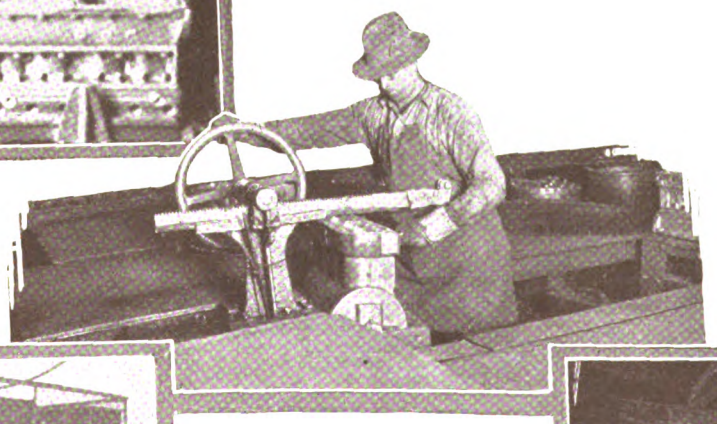
42—The cleaned castings come down from the mezzanine on special cradle conveyors. There are six sets of these conveyors at River Rouge.



43—The conveyors go past batteries of tumbling barrels and feed these barrels as well as carry away the cleaned castings.



44—The conveyors wind in and out among the batteries of tumbling barrels, finally making their exit close to the machining department.



45—At this point the core wires are pulled out through the inlet and exhaust ports by means of a simple yet ingenious rack and pinion mechanism.

frames, imprisoned in sand, make their return journey to the shakeout stations, becoming solidified the while. And more, later, about these journeys.

Walking down the length of the foundry along the cupola front and past the heavy molding systems, one sees in the space devoted to the lighter castings what appears to be a veritable forest of "merry-go-rounds." These are the light molding systems, each system consisting of an endless chain of pendulum conveyors, each link presenting a knee-high suspended shelf which is either carrying a fresh mold toward the pouring station or a smoking mold away from it. There are some twenty-one of these "merry-go-rounds" (as they are familiarly called) in operation today, and eight more being installed.

So much for the first general impression of the visitor. It is usually a confused one. The scale on which activities are carried out is so vast that it

(*Continued on Page 28*)



46—The last journey of the cylinders in the foundry is on the flight conveyor shown where the final chipping operations are performed. This conveyor acts as a feeder to the machine shop.



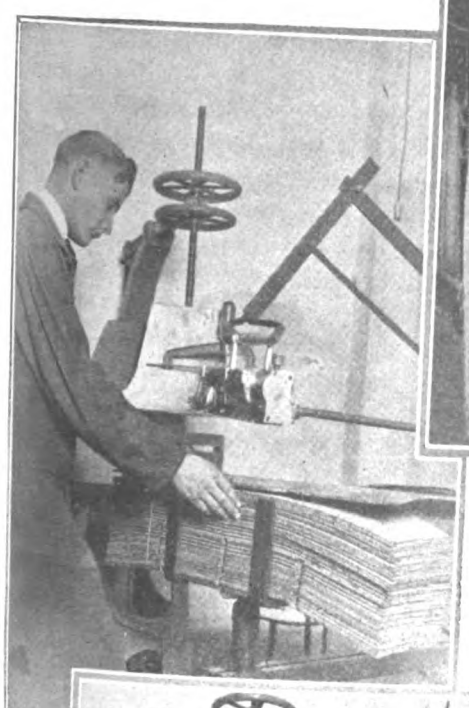
47—At the River Rouge foundry the castings made are machined before they leave the building. This is a view of the enormous machine department with its conveyors for carrying work in process.

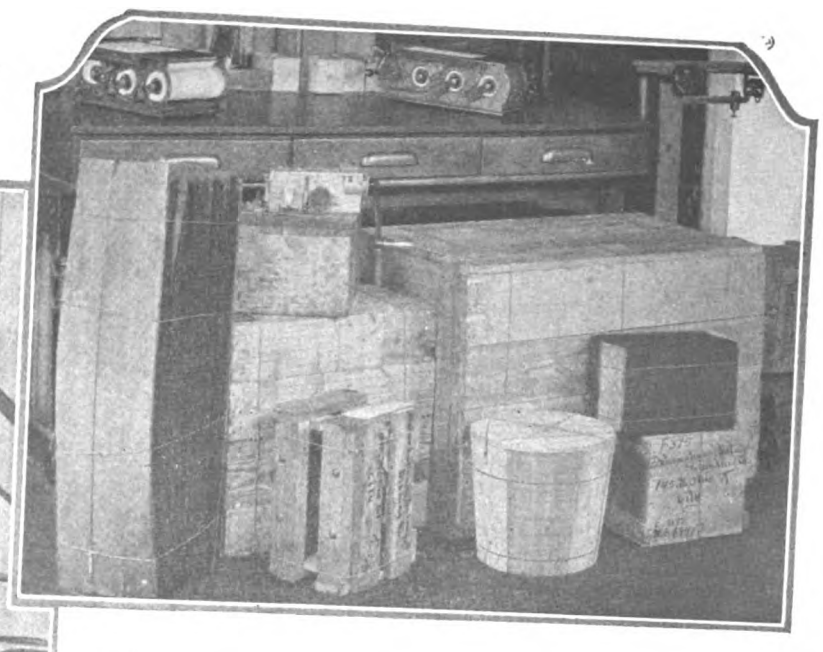
Digitized by Google

Better Bundles at Less Cost

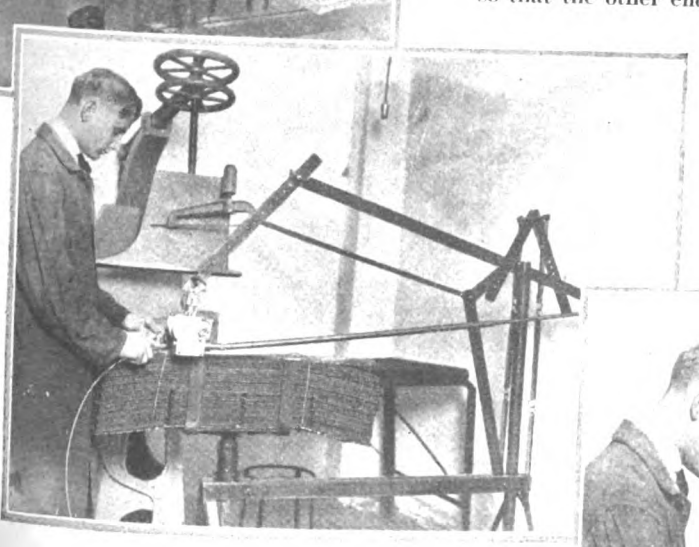
A Wire-Tying Machine of Recent Development

By H. M. Roberts



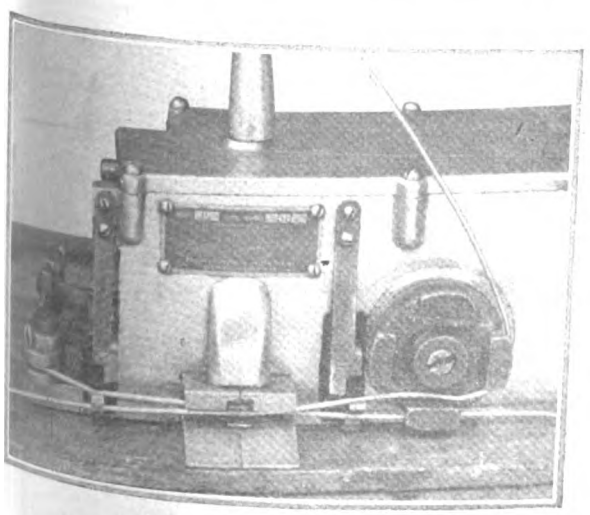


Various sizes and types of bundles tied by machine.

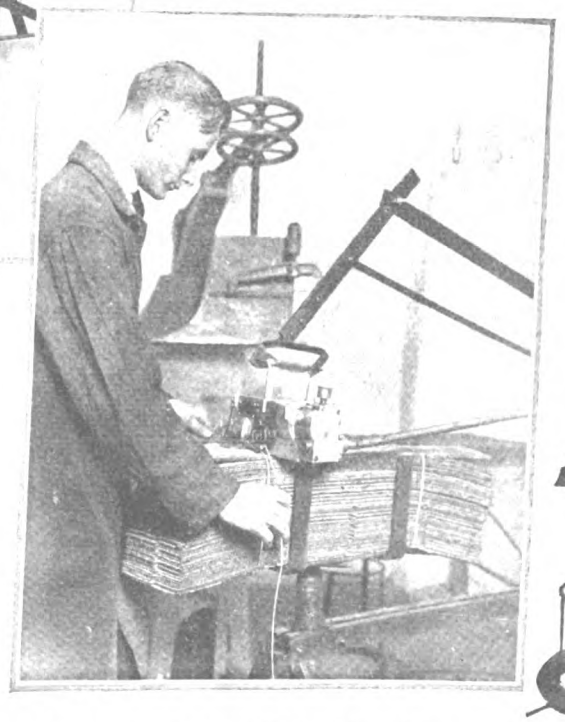


One end of a bundle of shingles has been tied, and the bundle is being swung around so that the other end may be tied.

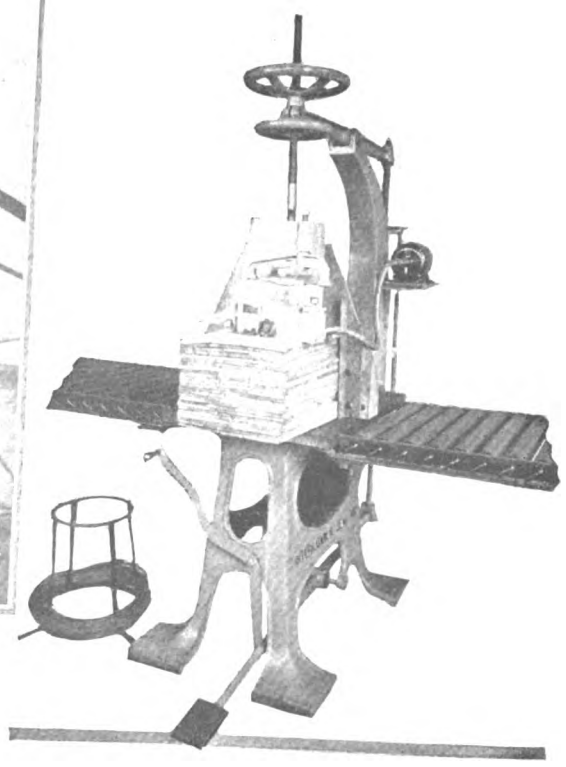
The completed bundle.



Details of the tying mechanism, with wire in place on rotating tension drum.



Operator ready to cut the wire after tying a bundle.



Tying machine, as used in conjunction with gravity conveyor in the packing department.

WHILE the economy and strength of metal-reinforced wooden packages has long been recognized by shippers, not much use of this style of package has been made in the past because there was no machine capable of doing the wiring or strapping easily, quickly, and economically. The recent invention of a wire binding machine, however, points the way to better bundles for manufacturers of various products—almost anything, in fact, from a wooden pail to a bundle of boards.

Not only does this device wire cases and bundles in a satisfactory way, but it also seals the package, as it were, since it is impossible to replace the wire after it has been removed, thus providing evidence of plundering during shipment and giving the shipper a good claim for damages.

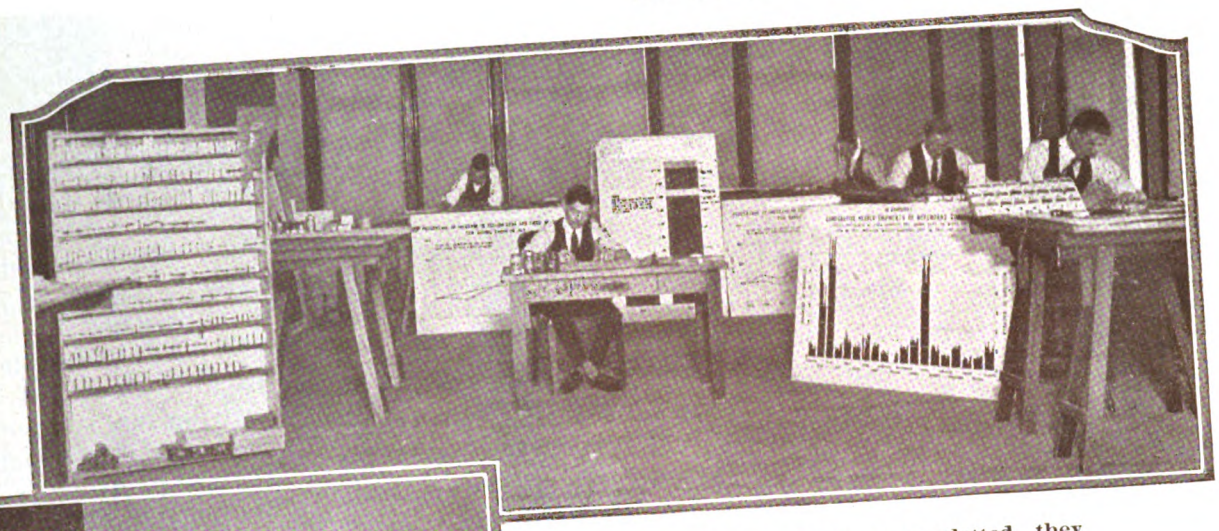
In the wiring of boxes this machine possesses numerous advantages over any other method heretofore employed.

(Continued on Page 32)

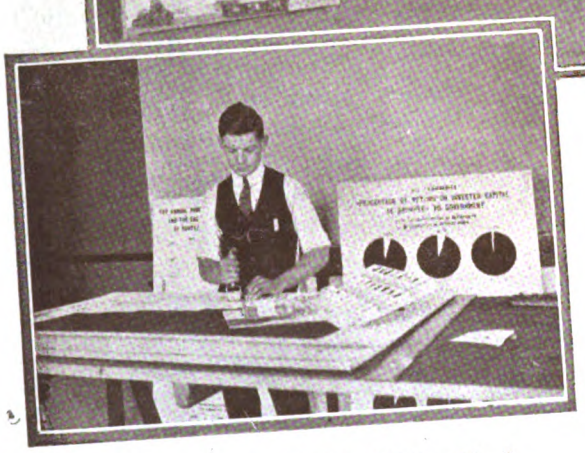
Digitized by Google

The Use of Large Graphic Charts in Litigation

By Joseph G. Breaznell



As fast as the charts were plotted, they were taken into this room for painting and lettering; being then checked, photographed and filed for ready reference.



Putting the gummed letters on a chart. Note the clear-cut appearance of the charts in the background.

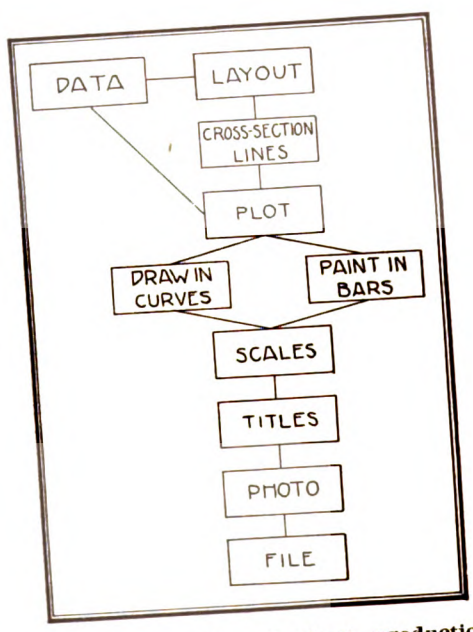
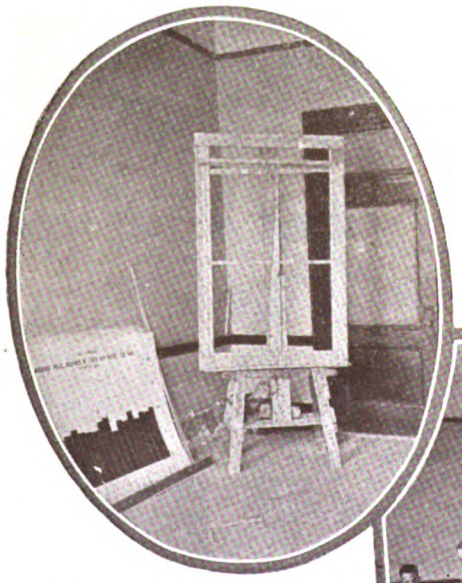
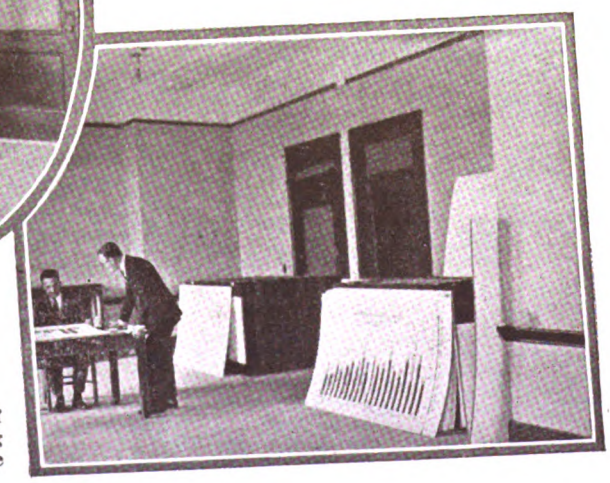


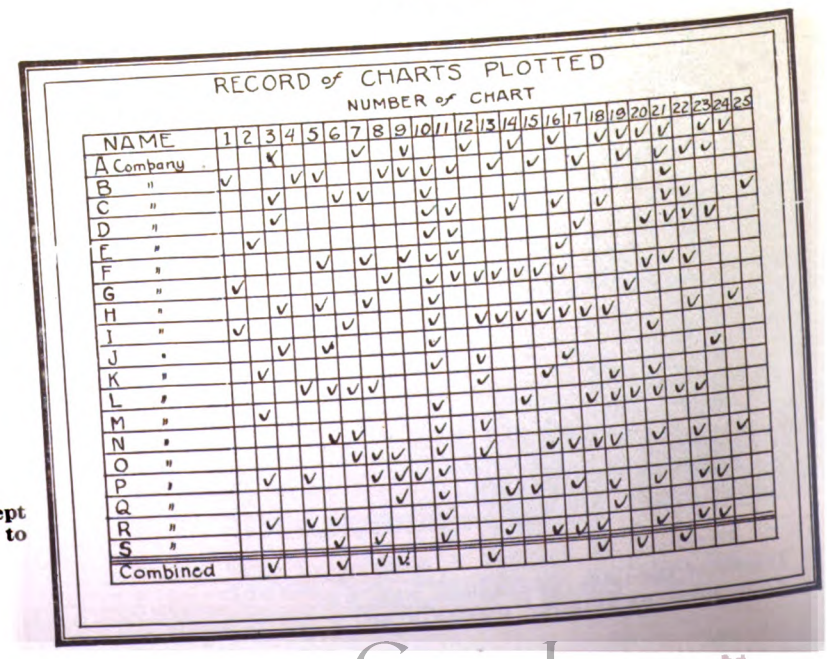
Fig. 1—Flow chart of chart production, showing steps in the construction of charts.



(In oval) The frame for holding the completed charts for photographing.



(Right) One corner of the chart room, showing the racks for filing the charts.



Score board, on which record was kept by means of serial numbers assigned to each chart.

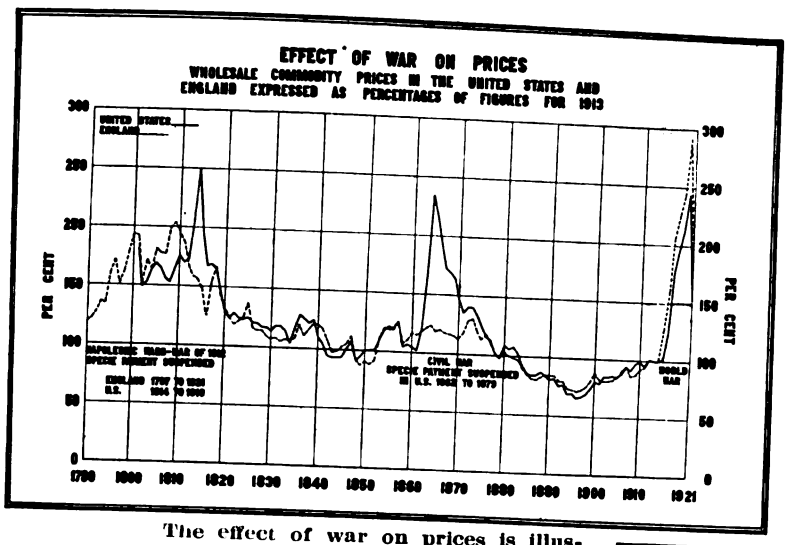
IN the recent trial of certain of the eastern cement manufacturers in the United States District Court, Southern District, New York, for alleged infractions of the Sherman Anti-Trust Law, large graphic charts played a prominent part in the defence.

Some five hundred graphic charts were constructed under the direct supervision of the writer in a period of less than three months. Of this number of charts, about one hundred and ten were exhibited during the trial and offered in evidence by the defence. While the balance were not shown in court, they were invaluable in studying the conditions and records of the various manufacturers.

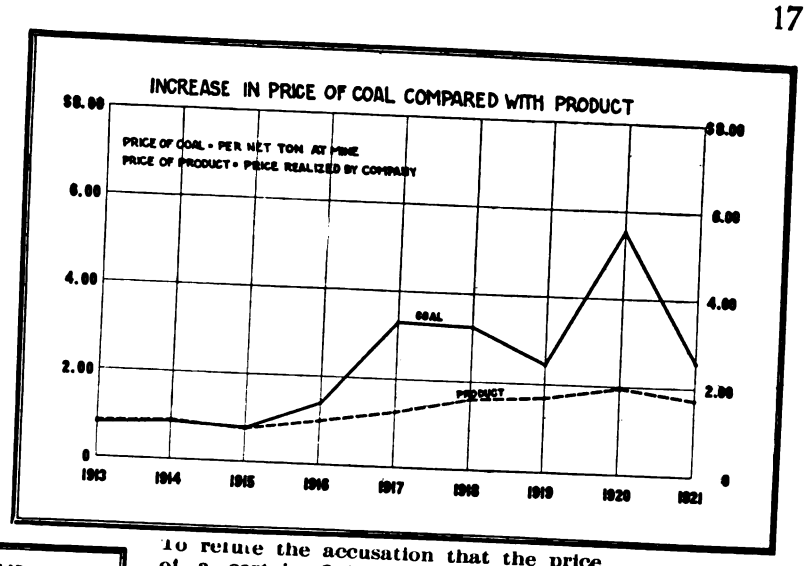
Charts were used in order to provide a way of showing at a glance the true condition as reflected by the great mass of figures showing the costs of manufacture and the financial conditions of the cement companies involved. Charts on general business conditions were a part of the number made and provided a comparison with the business done by part of the cement industry during the period of from 1913 to 1921.

The charts were made on large sheets of drawing paper mounted on cardboard. They were so designed and constructed as to clearly be vis-

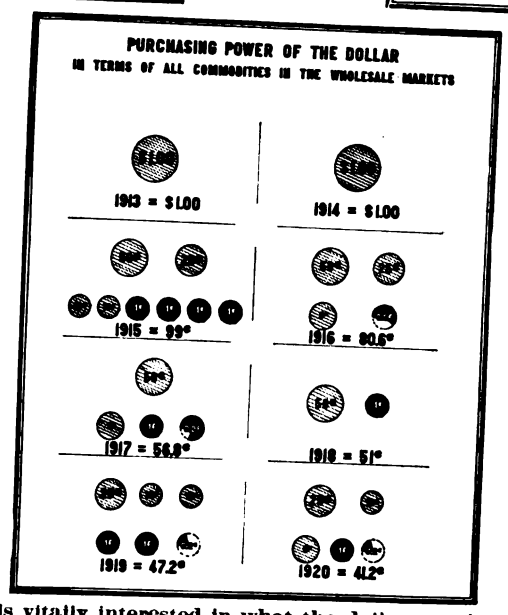
Digitized by Google



The effect of war on prices is illustrated by this chart. The solid line represents the increases and decreases for the United States and the broken line for England. This chart is valuable in showing that the recent war, like former ones, was the direct cause of a great increase in prices.



To refute the accusation that the price of a certain finished product has increased abnormally during the period charted, a comparison is made with the increase in the price of coal. In this case coal is one of the most important materials entering into the manufacture of the finished product. In the case of other products a comparison may be made with the increase in price of one of the most important raw materials needed in the manufacturing process.



Everyone is vitally interested in what the dollar will buy. The above chart shows the relative purchasing power of the dollar based on the amount it would buy in 1913 as 100 per cent. The use of symbols representing coins to graphically illustrate the declining value of the dollar gives to the lay mind the significance of these figures in a very striking manner.

This chart clearly shows that while the receipts from the sale of the manufactured product have grown greater over the period charted, the expense of manufacture has also risen at the same, and at times at a greater rate.

ible at a distance of twenty-five feet or more. The standard size was 40 by 60 inches. This size of sheet was large enough to permit the charts to be drawn to the required scale and was not too large for convenient handling. The cardboard backing made the charts easy to work on and greatly helped by facilitating their handling.

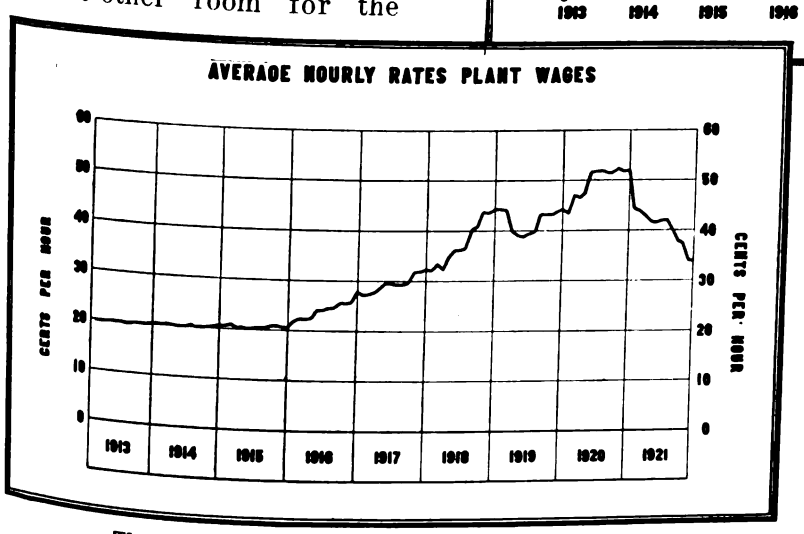
During the period of the work, from four to fifteen men were employed. Eight drawing tables were used, three fitted with automatic straightedges for drawing the cross section lines and plotting the data, and the other five for painting the bars and lettering the scales and titles.

The graphic chart work was done in two rooms. The three tables for plotting were in a room adjoining that in which the accountants prepared the figures. As fast as the charts were plotted they were taken into the other room for the painting and lettering. Here they were finished up, checked, photographed and filed in cases for ready reference in conferences.

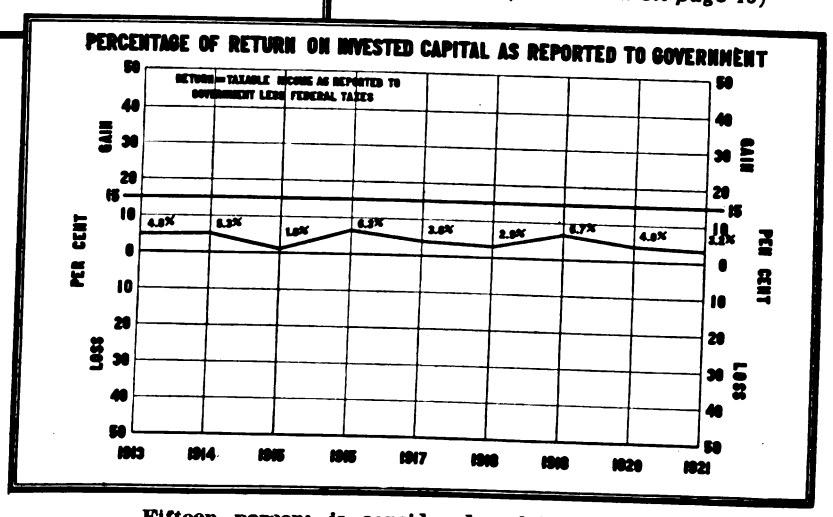
Fig. 1 is a flow chart showing the steps in the construction of the charts from the time that the data was submitted to the filing of the finished product for reference.

A list of the charts to be made was prepared and from this list the accountants made up the working sheets on which were tabulated the data to be graphically represented.

(*Continued on page 48*)



This chart shows the average hourly rates of wages paid to the workers of a plant. The monthly averages over the period of years from 1913 to 1921 show an increase to meet the rising prices in the cost of living.



Fifteen percent is considered a fair return on invested capital for industrial concerns by many authorites. This chart shows that in no year during the period represented on the chart did the return of the company exceed 6.7 percent. It will be noted that in the year 1915, the return was but 1 percent.

Digitized by Google

Handling 3000 Tons of Mail a Day

Mechanical Equipment of the New Chicago Terminal

By Robert H. Moulton

NOT so many years ago, if you wanted to send a letter from New York to the Far West, the postage alone cost as much as a good dinner; and the letter, traveling by Pony Express, might (or might not) reach its destination in the course of a few weeks. Today, your letter reaches its destination all the way across the continent, in as many days—and the postage is but two cents. Which is merely another illustration of what mechanical methods have accomplished.

Picturesque, romantic, and comparatively simple, the Pony Express was adequate to handle the small amount of mail matter in its day. As the railroads pushed their way westward, conditions changed: increased population brought with it an increase of transcontinental mail; the vast number of periodicals of national circulation that sprang into being helped to swell the total; finally, the parcel post introduced a new and serious problem in mail handling.

Meanwhile, as the railroads took over the task of transporting mail, transcontinental mail routes came to be more and more centered at one point—Chicago. Through the Union and Northwestern railway and the adjacent stations in Chicago, flows the mightiest flood of postal matter that is centralized at any one point on earth. Mail from every hamlet, village and city in the nation is constantly passing through these terminals. Until recently, however, the railway mail service at Chicago operated under adverse conditions in the form of facilities that were inadequate for the rapidly increasing volume of business.

In 1919 a committee of the railway mail service made a thorough study of the operations at Chicago. As a result of this study, the necessary facilities to correct the existing conditions, and a comprehensive scheme of terminal operation was adopted. The plan called for a site conveniently located for both railway mail cars and auto trucks; a building of adequate dimensions and design in which to handle the mail economically; and an extensive application of mechanical apparatus.

The result of all this is that there has just been completed, as a part of the new Chicago Union station project, a railway mail terminal building which is unique among such structures. It is not only the largest existing building of its sort, being

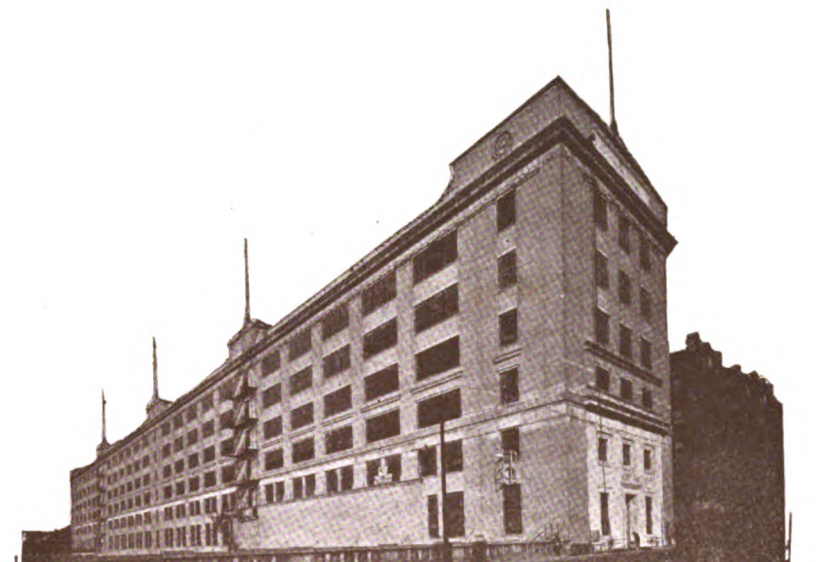


Fig. 1—New Mail Terminal Building, Chicago.

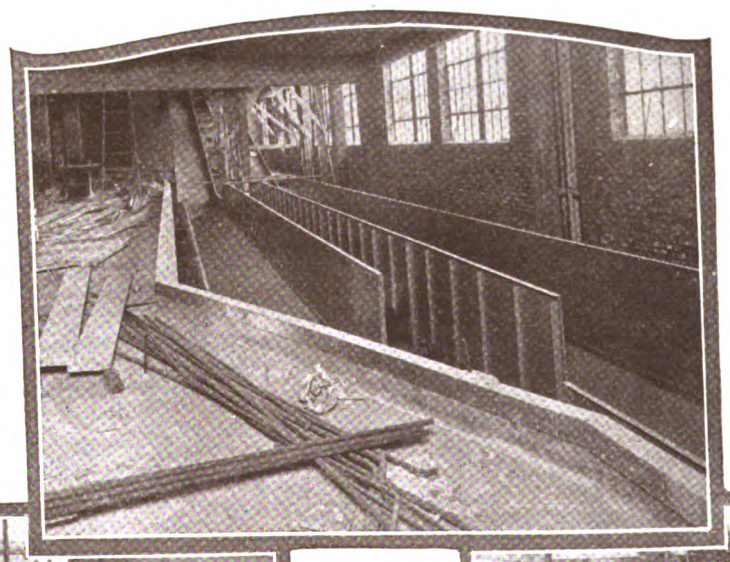


Fig. 2—Conveyors 1 and 11, which receive the precancelled mail brought in from outside.

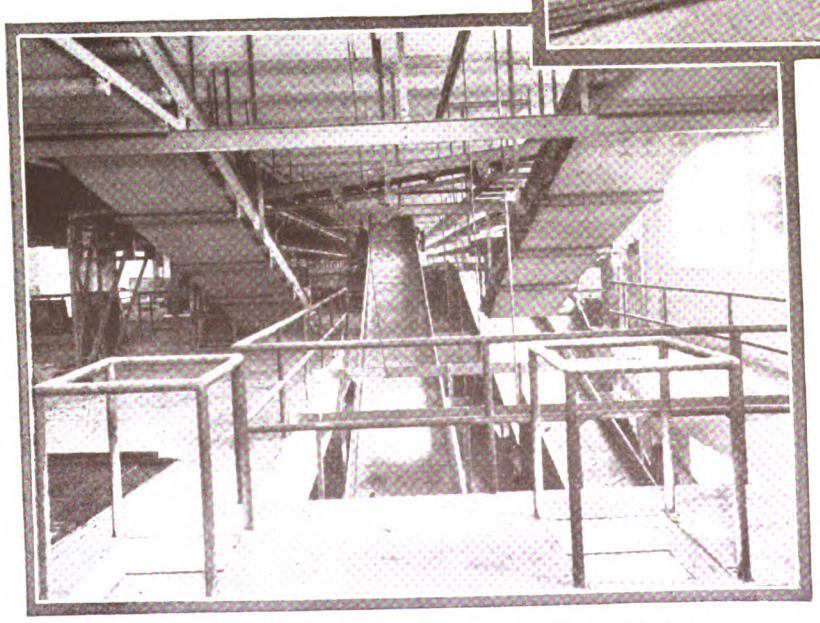


Fig. 3—Showing the top of the feed belts 1A and 11A coming up to the third floor Separation Unit.

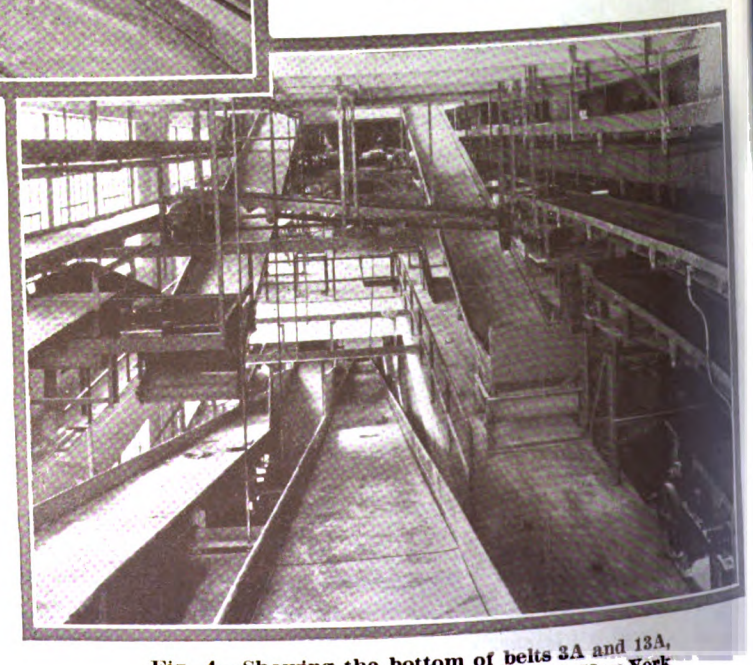


Fig. 4—Showing the bottom of belts 3A and 13A, which feed the state belts for Missouri, New York and Kentucky, and a view looking down belts 1A and 11A.

Digitized by Google

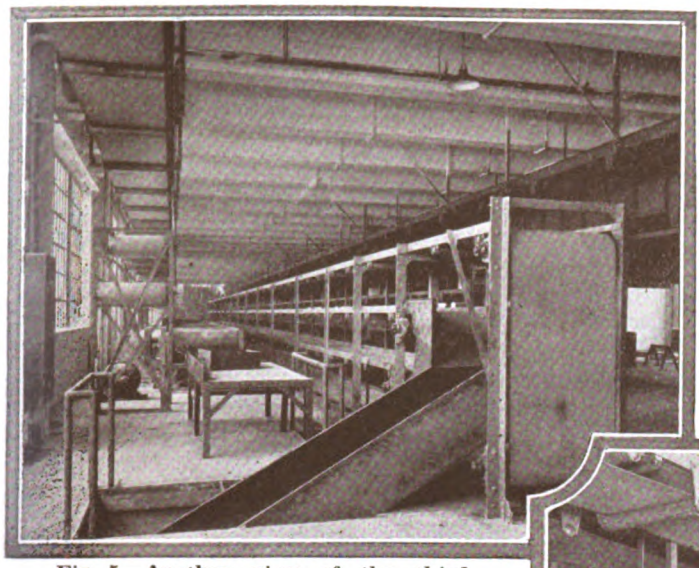


Fig. 5—Another view of the third floor Separation Unit, showing the farthest end of belt 1A.

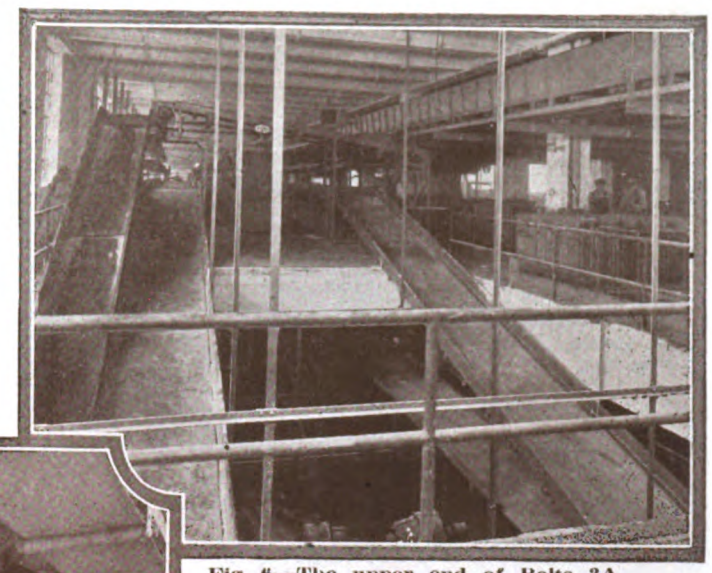


Fig. 6—The upper end of Belts 3A and 13A landing on the fourth floor and feeding the fourth floor Separation Unit.

800 feet long by 75 feet in width, with a height of six stories above basement, track level and sub-basement, but contains mechanical conveyor and transportation equipment without an equal in the world. This equipment is capable of handling 3000 tons of mail each 24 hours. A further idea of the magnitude of the operations carried on in this terminal will be gained from the fact that more than 1000 clerks and porters are employed in the railway mail terminal department alone.

The mail terminal building extends from Van Buren to Harrison street, between Canal street on the west and the Chicago River on the east, with a private driveway along the full length of the east side. The building is of the latest fireproof design of steel and concrete, and is furnished throughout with factory-type steel sash to provide the maximum light and ventilation. Its floor capacity is 500,000 square feet. It is of the two-level type and is served by platform tracks on the lower level and a teamway on the street level; the private driveway referred to affording 580 feet of clear tailboard space, or enough for 60 street vehicles at one time. The track level has platform lengths adequate to serve 61 cars, while the basement affords communication, by means of tunnels, with cars at Union station platforms remote from the mail terminal.

Perhaps the most notable feature of this terminal is the system of belt conveyors em-

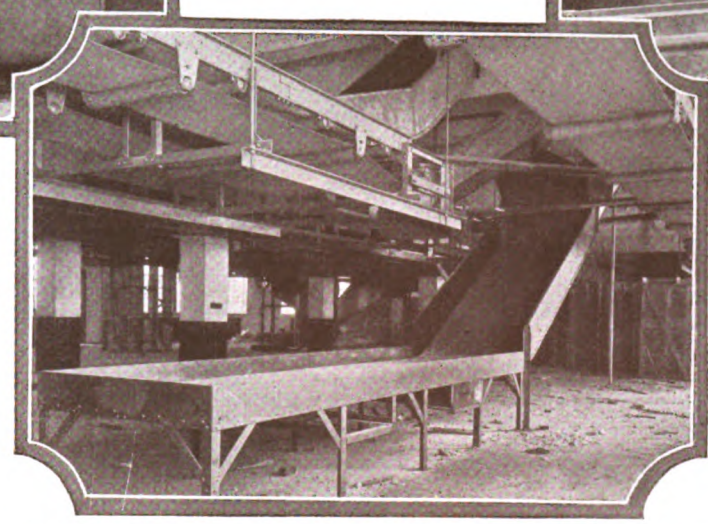


Fig. 7—The state belts deliver to individual State tables. The picture shows one of these tables. From these separation tables the bags of mail are carried in balanced type trucks to holes in the floor beneath which the ceiling bag conveyors operate.

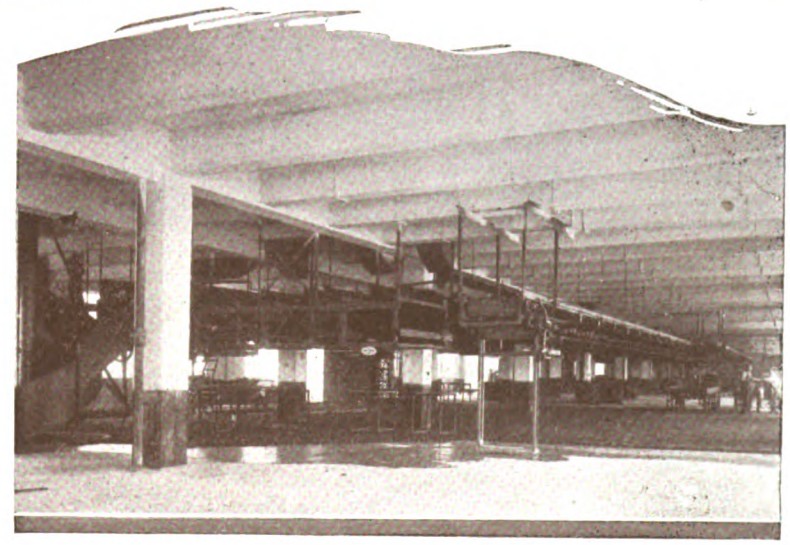


Fig. 8—Showing the ceiling conveyors and the small chutes leading to them. At extreme left is part of a spiral chute and the chute from ceiling conveyor to the same.

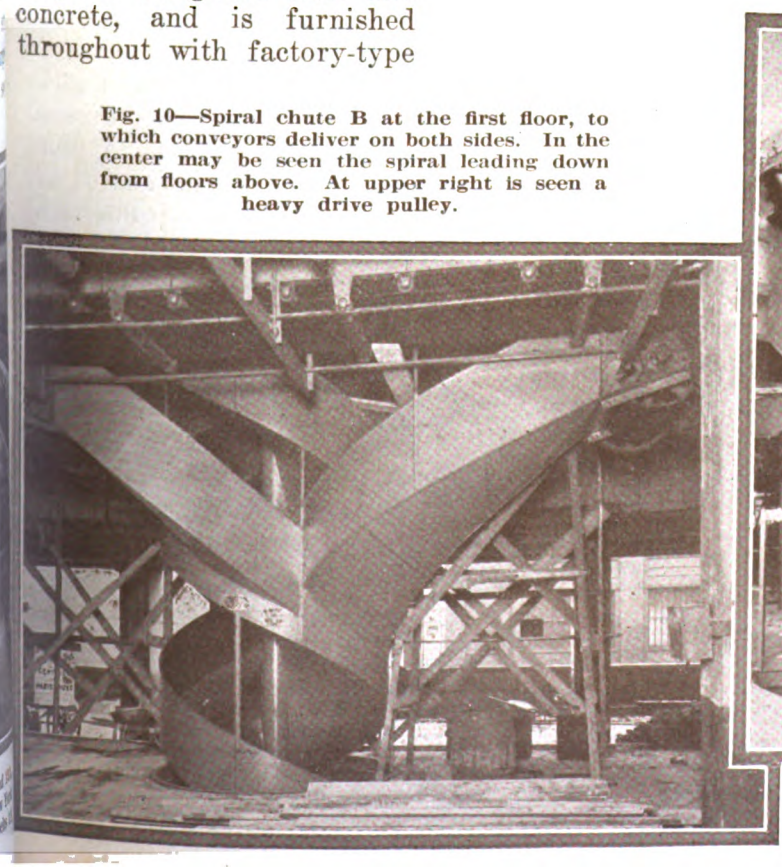


Fig. 10—Spiral chute B at the first floor, to which conveyors deliver on both sides. In the center may be seen the spiral leading down from floors above. At upper right is seen a heavy drive pulley.

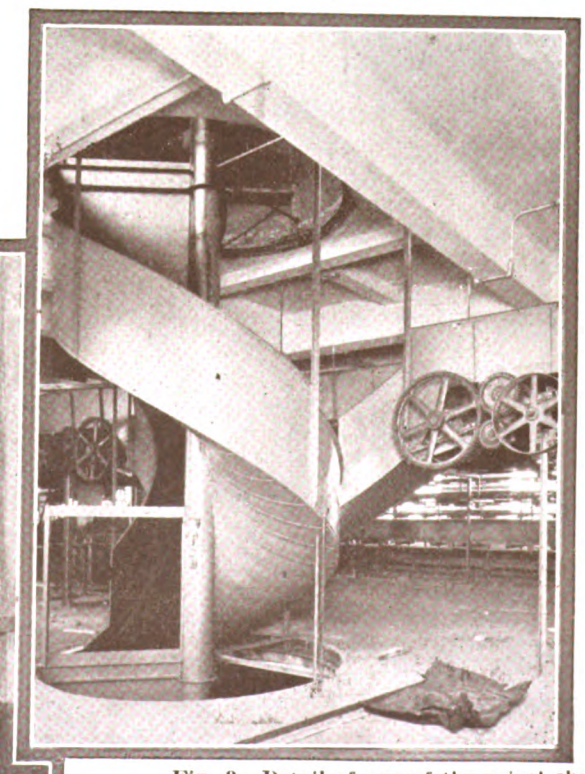


Fig. 9—Detail of one of the spiral chutes with delivery from head of conveyor with the chute. This also shows the driving mechanism at the head of one of these conveyors.

Digitized by Google

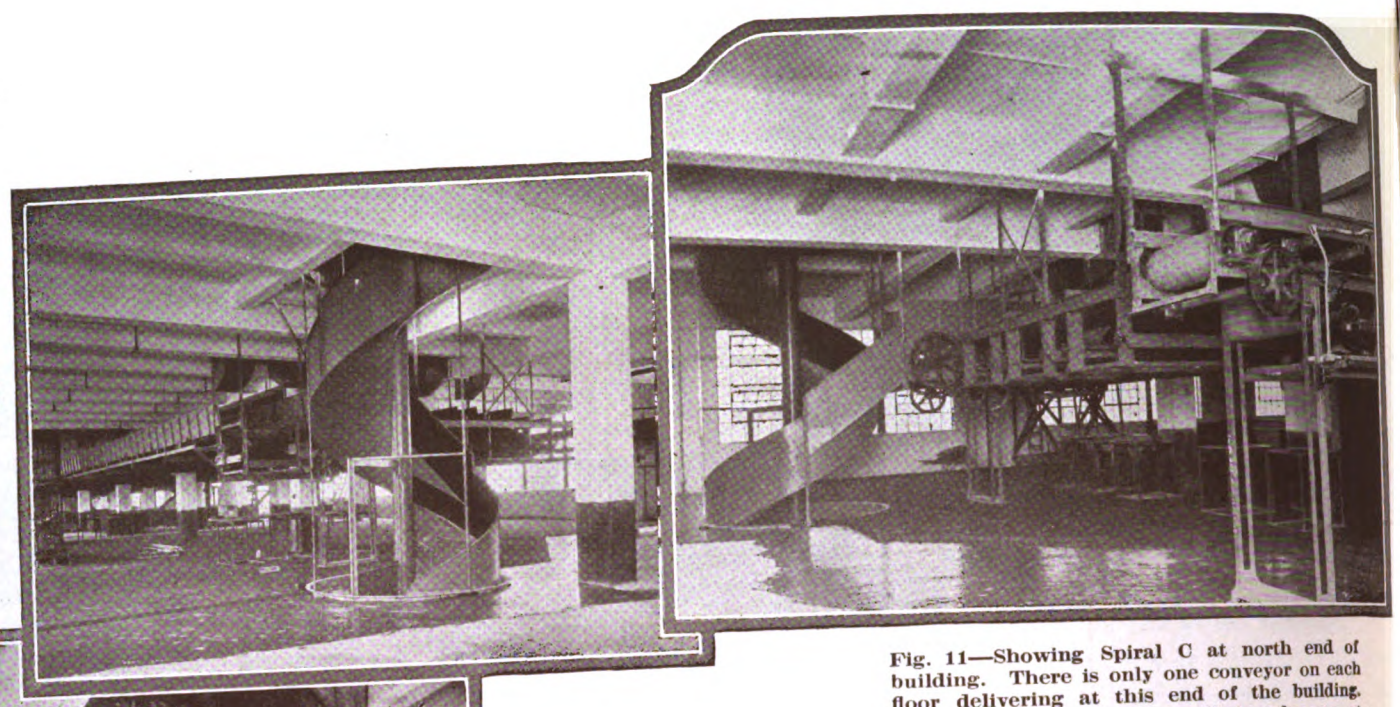


Fig. 12—Another view of spiral C (shown in Fig. 11). These views are typical of the different floors.

Fig. 11—Showing Spiral C at north end of building. There is only one conveyor on each floor delivering at this end of the building. The other conveyors have their take-ups at this end. These take-ups are 6 feet long.

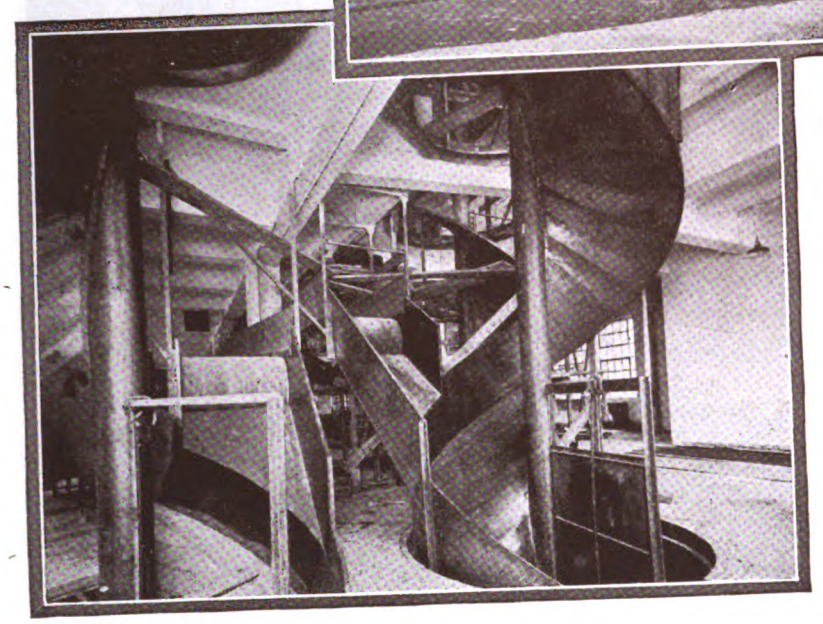


Fig. 13—Showing entrance of conveyors into Spirals D and E. At lower right is the type of fire-door used to seal up the opening in case of fire. This door is shown held up by a rope, but it will be held by means of a chain and fusible link.

ployed in the building. According to the resident engineer who has been in charge of the installation of the mail handling equipment, this system is the largest installation of its kind in the world. It consists of 71 belt conveyors, requiring the use of approximately eight miles of belting; 400 tilting trucks of a special design; 1,200 balanced type trucks of a standard type; and a sufficient number of tractors to handle the trucks effectively throughout the building. In addition to these facilities there are 15 freight elevators, approximately 8 x 18 feet each.

The terminal has a variety of functions. One of the most important is the handling of mail received from and delivered to trains at the Union station; consisting primarily of the transfer of mail sacks from street vehicles to mail cars and vice versa. A great part of the operations of the terminal, however, consists in

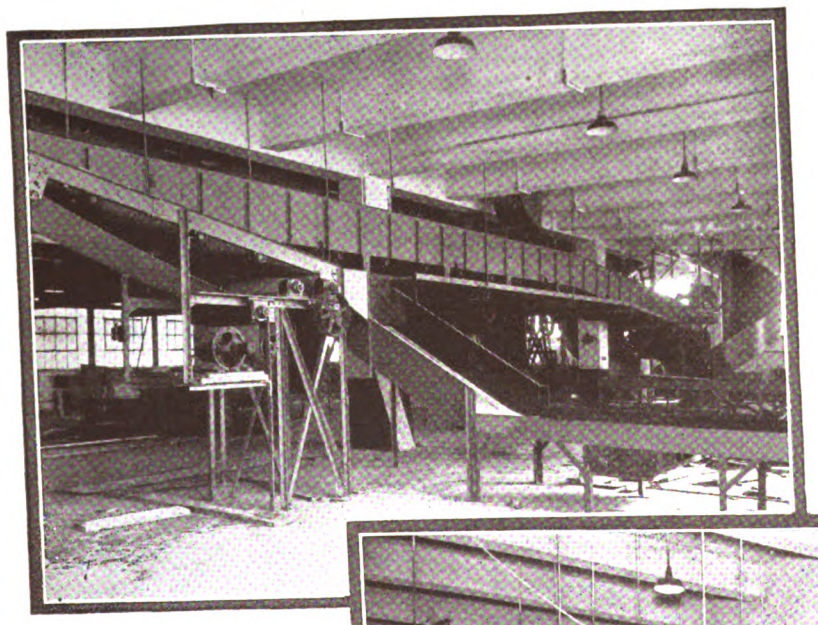


Fig. 14—Showing the delivery from a state belt, also the light drive used for state belts. Dust-proof roller bearing housings show at upper left.

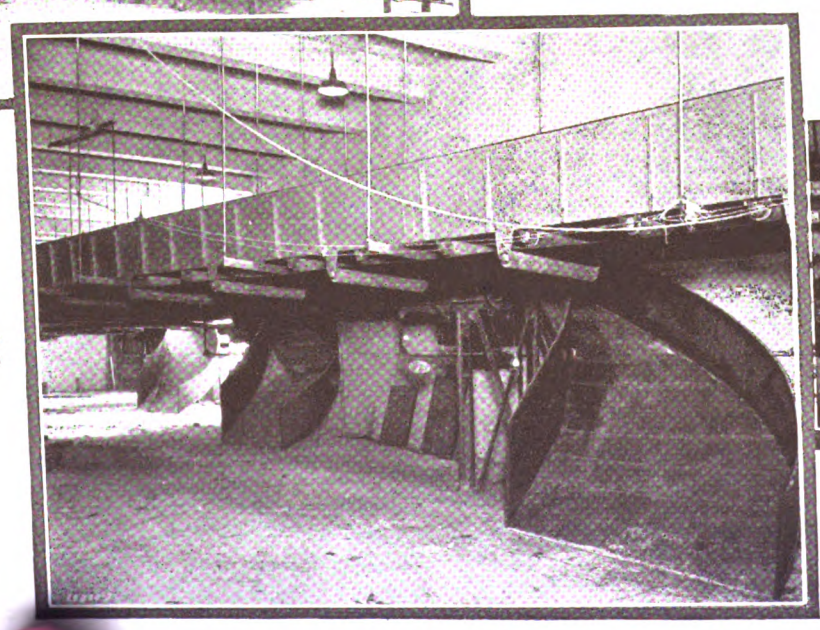


Fig. 15—Showing delivery at first floor from Skew-belts.



Fig. 16—Workmen making a splice in one of the canvas belts. Flexible lacing is used. The ends of belts are pulled together by means of clamps, and the teeth mesh together with a strip inserted to keep them from pulling apart.

Digitized by Google



Fig. 17—The Station controlling panel, separation unit.

the receipt, classification and dispatch of all papers, catalogues and parcel post mail originating in Chicago, as well as mail of these three classes passing through the city. While the bulk of the material is received in the terminal already weighed and with the postage canceled, a portion of it has not undergone these operations, and to take care of the latter a post-office has been provided in the building.

Unclassified mail reaching the terminal from the street is received along the middle portion of the private driveway space; that from trains, on the basement or track level. From these two points of receipt it is delivered to the upper floors of the building for the necessary work of classification.

Formerly parcel post mail originating in Chicago was sacked and loaded into trucks at business houses and transported to the mail station. From 25 to 30 minutes were required to load a truck and a similar length of time to unload it. Under the new system the same work is done in from three to five minutes at each

(*Continued on page 70*)



Fig. 18—Balanced type trucks similar to those used to transfer bags of mail from the separation tables to the holes in the floors connecting with the ceiling bag conveyors.



Fig. 19—Showing how packages are unloaded on to conveyor. Tilting trucks used to bring mail from large firms in motor trucks to Post Office. There are 400 of these trucks.

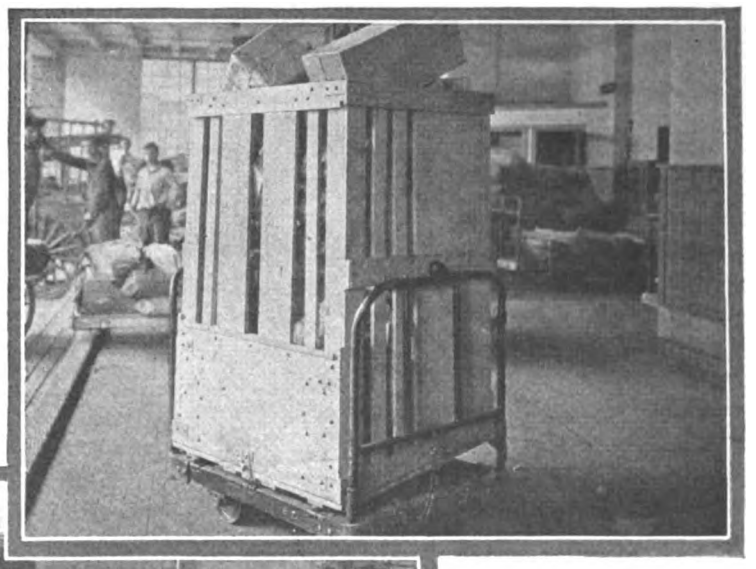


Fig. 20—One of the Tilting Trucks loaded with packages.

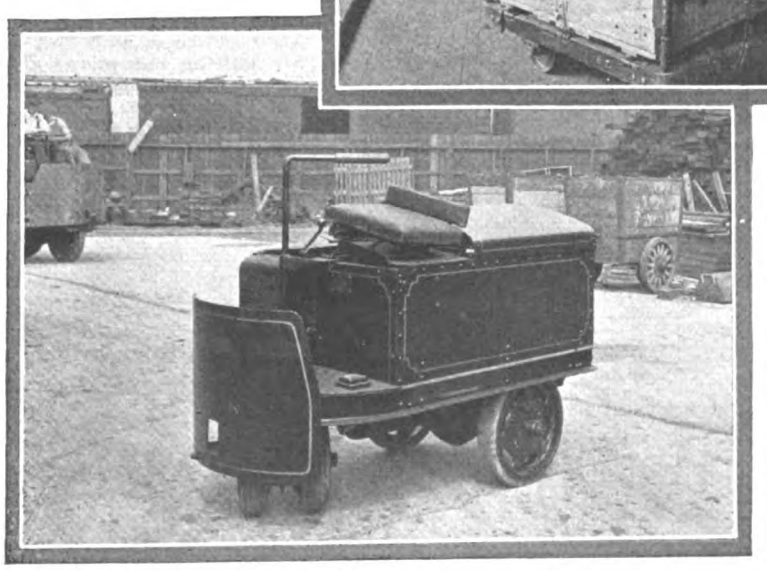


Fig. 21—Tractor, used to take mail sacks to mail cars after sorting.



Fig. 22—Another type of tractor used in connection with the small mail trucks.

Digitized by Google

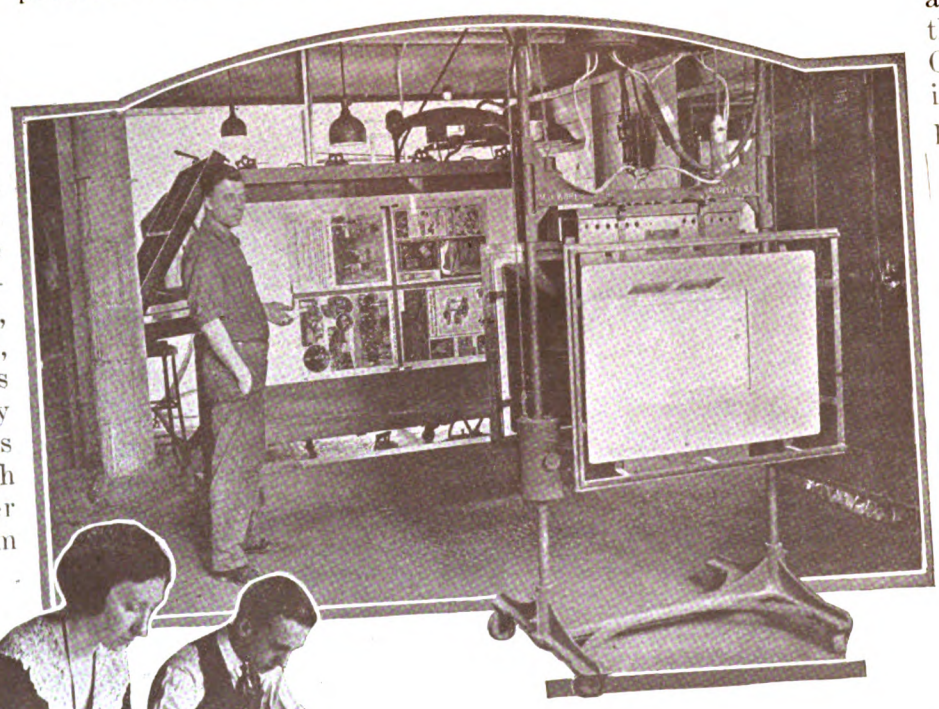
The Modern Version of an Old Art

How Mechanical Methods Have Developed Rotogravure from the Old Photogravure Process

BY S. T. THOROGOOD

AS you loaf at your shirt-sleeved ease of a Sunday morning, puffing the jimmy-pipe and browsing through the picture section, it may seem a far cry from the paper on the wall to the paper in your hand, the shirt on your back and the copper-plate calling cards in your vest pocket. But, from the printing point of view, they "are sisters under the skin." In each case what you see—wallpaper pattern, shirt stripes or figures, beautiful script on the cards, and pictures in the paper—is put on the paper or fabric by a printing process which is fundamentally the same, though the appliances employed differ so radically they hardly seem to belong to the same family, any more than their products do. But it is all intaglio printing. The earliest form of this process is the hand-engraved copper plate. The latest is rotogravure, modern of the moderns, a completely mechano-chemical process.

All printing falls into three classes, and only three. It must be typographic as it is called, when the printing face of the type or plate projects in letters, lines or dots which take the ink, while in between are the gaps or hollows where the paper is not to be printed. Or it must be planographic, as in a lithograph, where the printing plate or stone has a



1—A big camera which photographs a positive of four newspaper pages. The carbon negative from this camera is placed on a copper cylinder and its impression is etched on the copper by means of acids. The newspaper is then printed with the copper clyinder, which process gives the page its soft, velvety finish—the finish which makes rotogravure in newspaper supplements, magazines, etc., so popular with the reading public.



2—The man at the left is scraping out the margins on a page of film from which the carbon sheet used in the etching process is made. The woman and the man at the right are cutting out pictures from sheets of film. These cut pieces of negative are afterwards put in their proper places on a page and a positive is made.

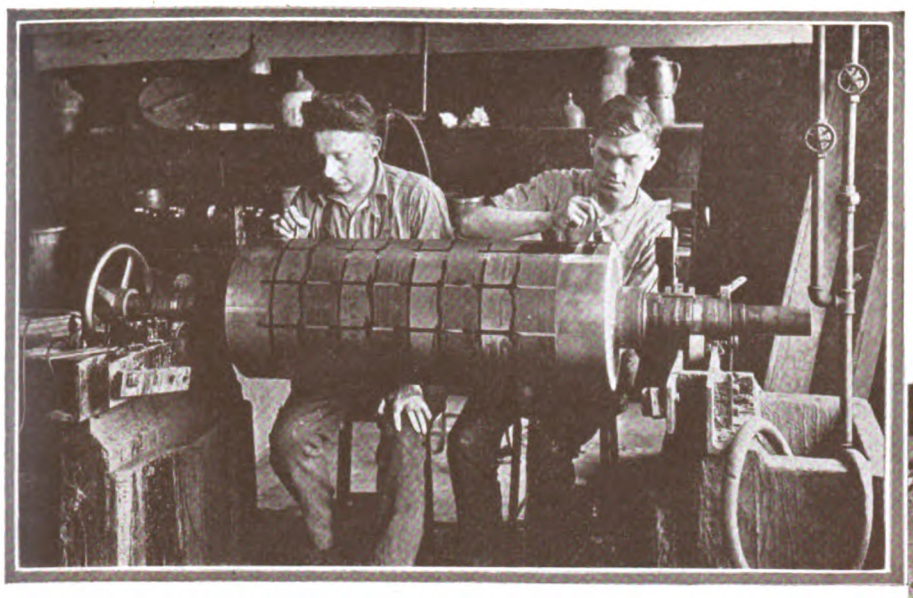


3—After the pictures for a page are photographed and a positive is made, a retoucher touches up the positive before the carbon sheet is made for the copper cylinder. Here you see a picture of a retoucher at work.

4—Putting the carbon sheet from the camera on a copper cylinder. The carbon is put on smoothly and then the pictures and type are etched on the copper by means of acids.

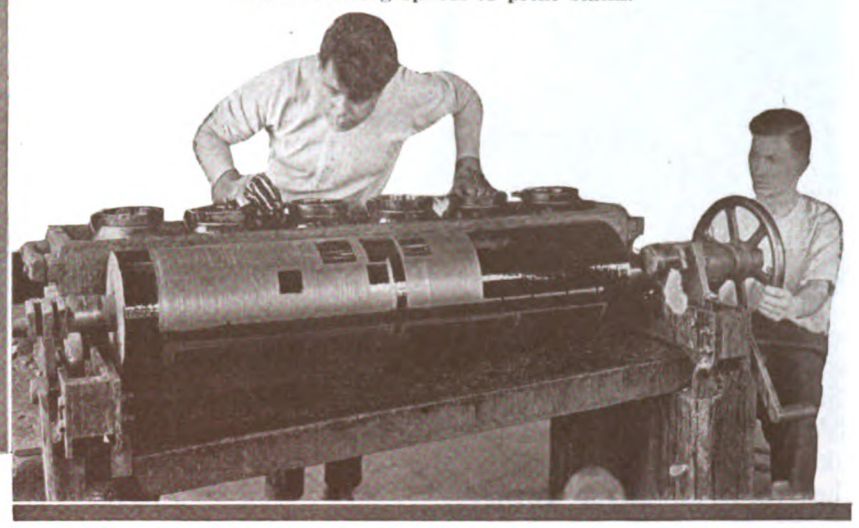


Digitized by Google



5—Painting out the margins on a copper cylinder after the carbon sheet from the camera is put on. Black asphaltum prevents the etching acid from affecting the spaces that are to appear white on the printed page.

6—Etching pictures and type on a rotogravure press cylinder. Acids etch into the copper the impression on carbon sheet from camera seen in illustration No. 1. The black spaces are covered with asphaltum to prevent the acids from affecting spaces to print blank.

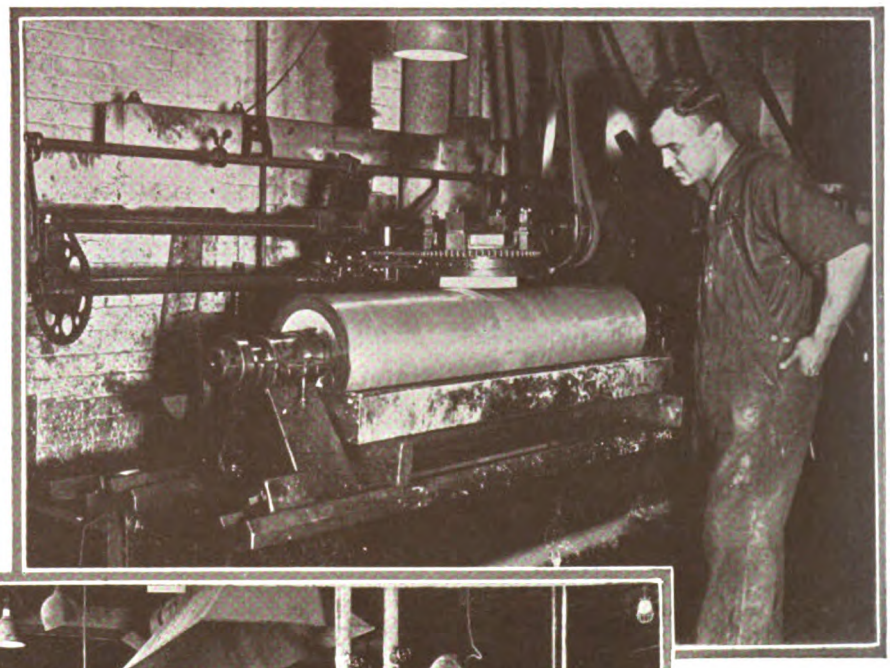


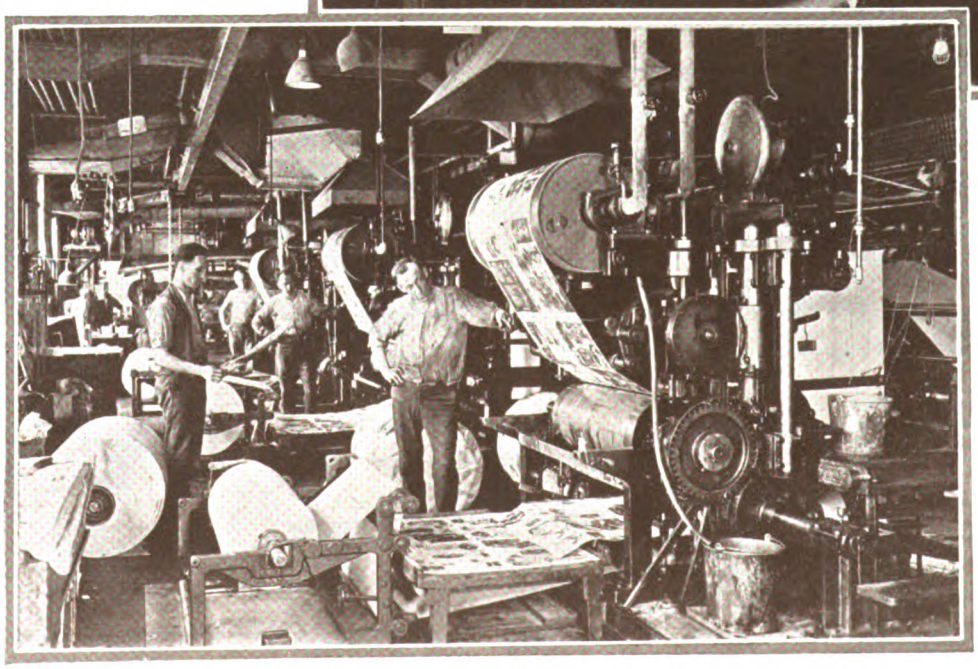
perfectly level surface, without projections or depressions, upon which the ink is laid. Or, lastly, it must be intaglio, in which case the ink lies in depressions in the surface of the printing plate or roll. The honey in a honey-comb, the capping of the cells having been removed, gives a rough idea of this process, on a very large scale. On the rotogravure printing roll the ink cells are, at most, 1/500″ square, and from .004″ to .009″ deep.

As in the case of so many modern processes, rotogravure is the refinment and speeding up of an earlier art. Photogravure has been familiar for a comparatively long time as a means of producing beautiful copies of the finest pictures. Its mechanical limitations restricted it to use in books, magazines and single copies for which a comparatively high price could be charged, to pay for the cost of production, and where the element of time permitted its slow speed. Rotogravure is simply rapid, rotary

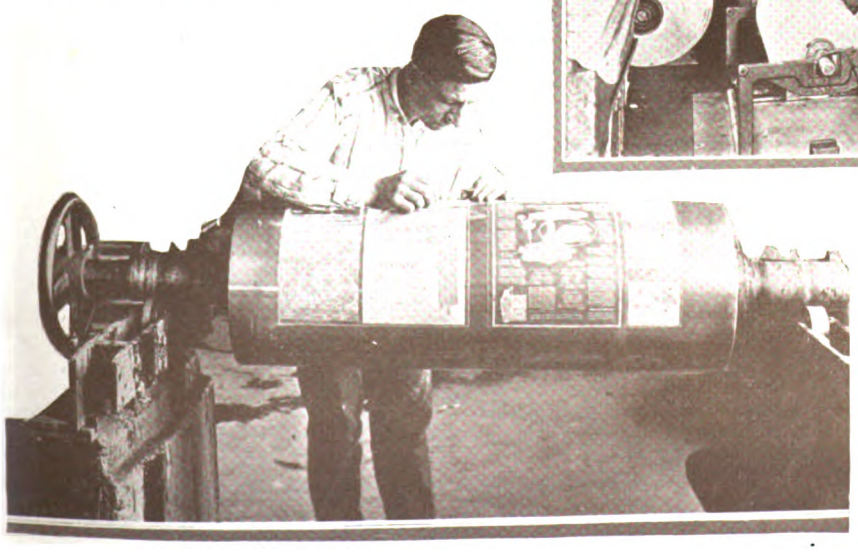
(*Continued on page 52*)

7—Grinding off a copper cylinder after it has been used in printing four pages of a rotogravure newspaper supplement. A Tam O'Shanter stone (imported from Scotland) cuts down the copper, removing the etching. This stone revolves and so does the cylinder; and the result is perfectly even grinding. When this process is finished the cylinder is used again, this being repeated until the cylinder is worn down too much to be used; whereupon it is given a new coat of copper.





9—General view of presses in one of the largest rotogravure plants in the country. The lower cylinders print one side of the paper, and there are cylinders in the rear which do the other four pages of the newspaper.



8—After four pages are etched on a copper cylinder, this man goes over the cylinder and corrects any small defects that may be seen under a magnifying glass.

Digitized by Google

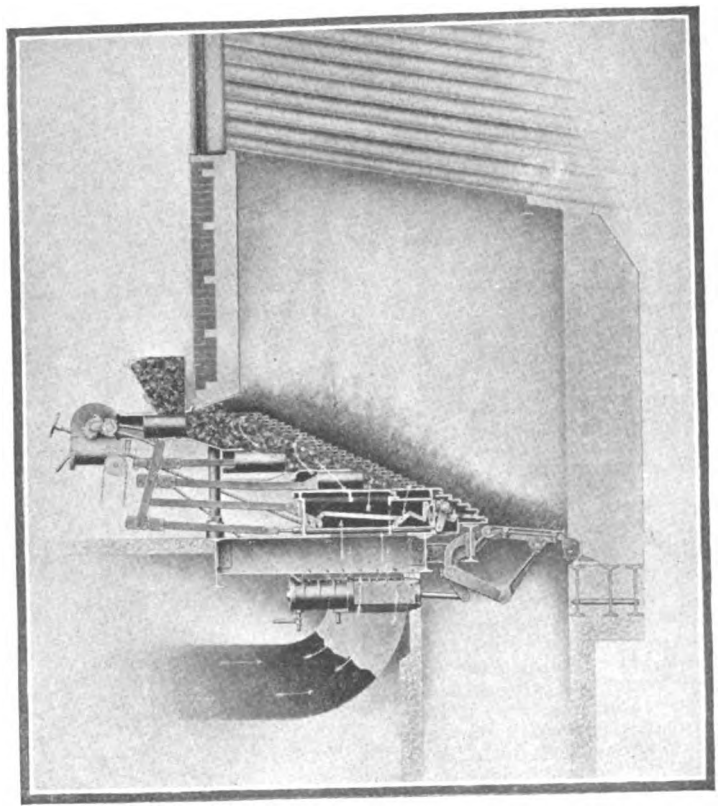
Ash Discharge on Underfeed Stokers

By David C. Spencer

ONE of the problems which constantly confront boiler room engineers and operators, is the matter of cleaning fires and discharging the ash. To the average layman, this may seem like a simple proposition. In the case of small furnaces where operation is carried on at nominal rating or less, possibly the situation is not so difficult a one to handle. But in these days of large units and continuous operation at high over-ratings, the problem assumes an entirely new aspect.

Boiler operation may be classified in two groups. There is the station or plant whose load changes frequently, sometimes slightly, at other times in violent swings. The boilers may be delivering steam at 100% of rating at one minute, and be required to deliver 200 or 300% of rating five or six minutes later, with an equally sudden drop when the load goes off. Such experiences are not infrequent in Central Station practice or in such industries as pulp and paper mills, rolling mills, power stations of coal mines, etc.

Then there is the station whose load is fairly constant for an extended period of time. Such changes as occur are gradual and can usually be anticipated. There are practically no sudden fluctuations. Instances of this class are found in the case of power companies operating two or more stations, one of which carries the swing, while the others operate at a uniform rate. Among industrial plants a good example would be a shop equipped with machine tools or a spinning or weaving mill where production is fairly steady.



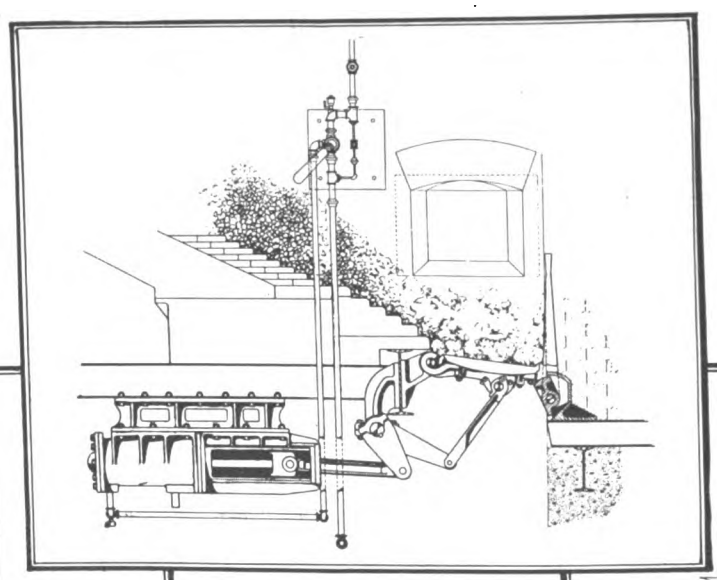
1—Cross section of stoker equipped with power dump showing characteristic outline of underfeed stoker firebed. Arrows indicate distribution of air.

It sometimes happens that one station will combine the characteristics of both classes; in other words, certain boilers are depended on to carry the average load, operating at the point of their maximum efficiency, while one or more additional boilers would be carried as standbys to pick up the excess load when required.

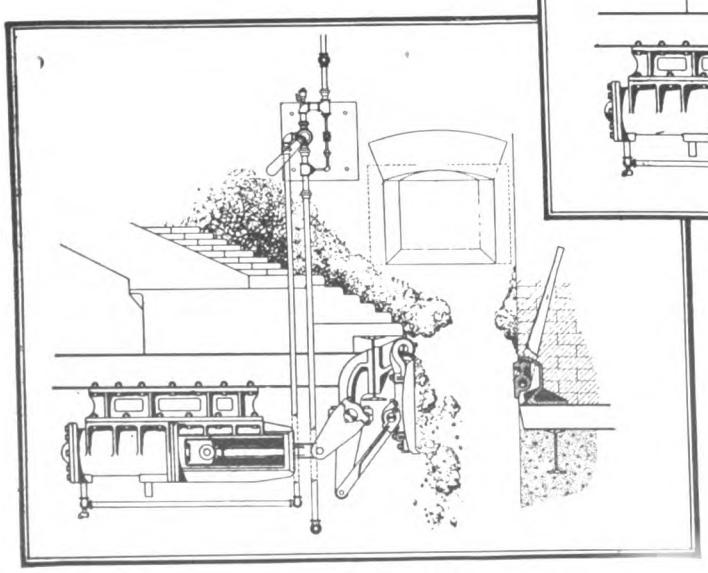
Each of these classes presents its own peculiar problem in the matter of cleaning fires.

In stations of the first classification, the operator's problem is to deliver steam when and in the quantity that is required by the plant processes. In the case of Central Stations supplying light to the community and power to the traction lines, a sudden storm, for example, means an instant increase in both the lighting and power load. This increase must be met and carried by the boilers.

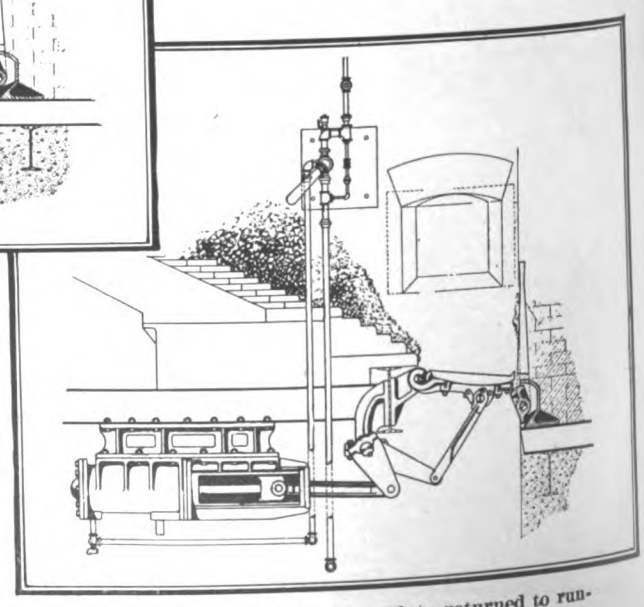
In the industrial field, the



2—Power dump ready to dump.

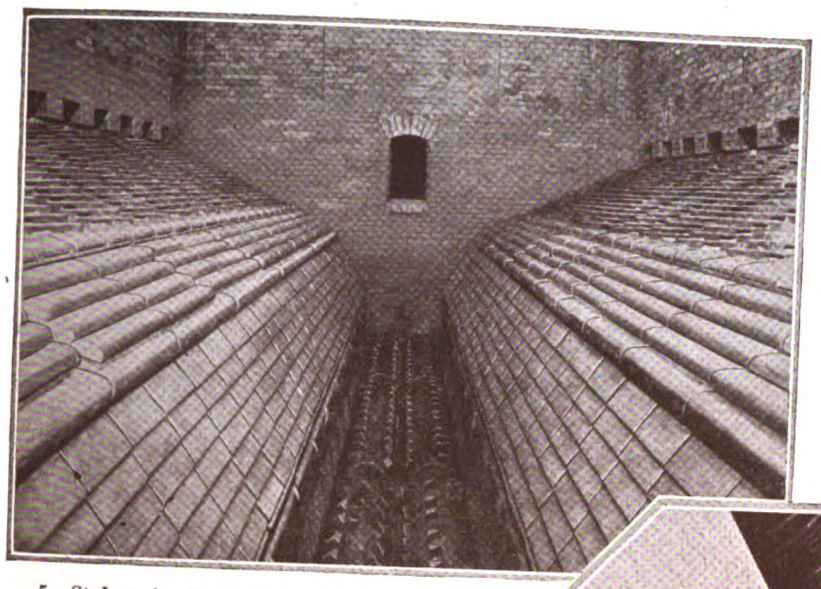


3—Power dump with plate dropped.

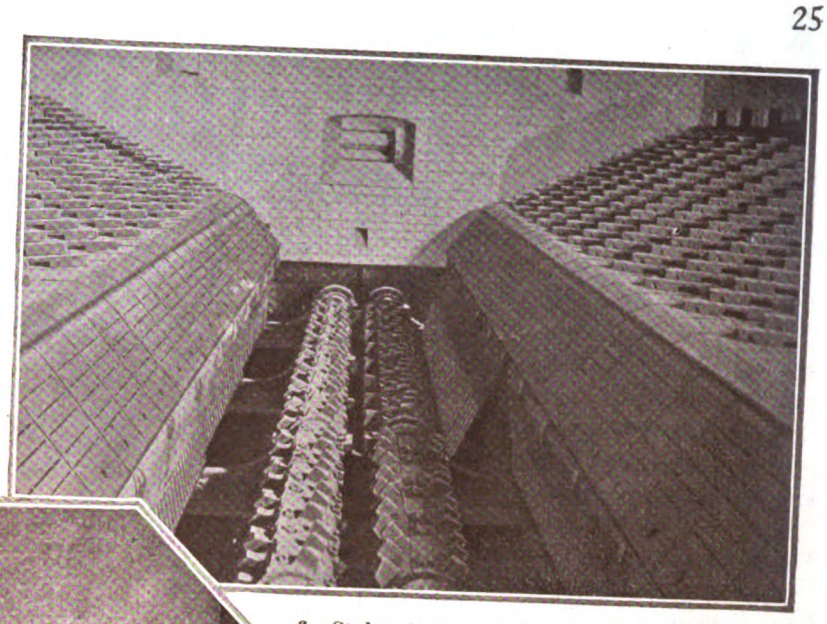


4—Power dump. Plate returned to running position.

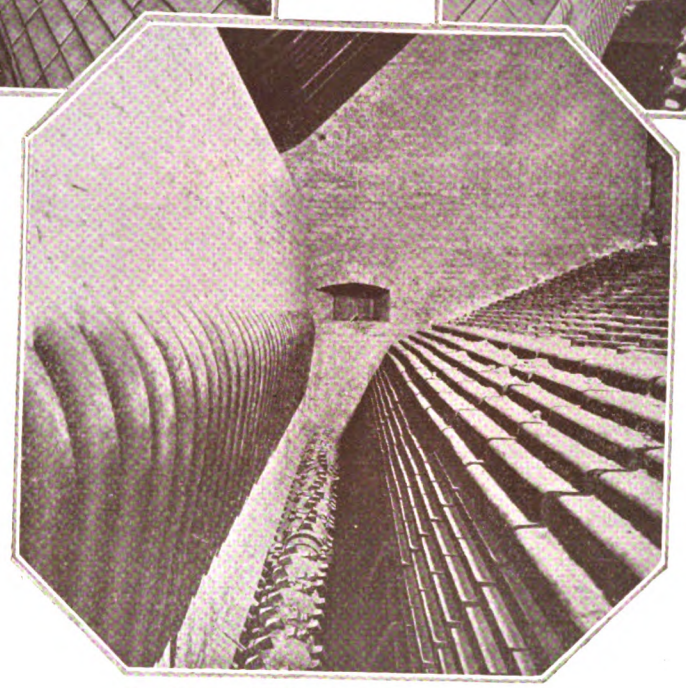
Digitized by Google



5—Stoker in Hell Gate Station, United Electric Light and Power Company, New York City, fitted with rotary ash discharge.



6—Stoker in Solvay Process Co. Syracuse plant, fitted with rotary ash discharge. One crusher plate in running position with others wide open.



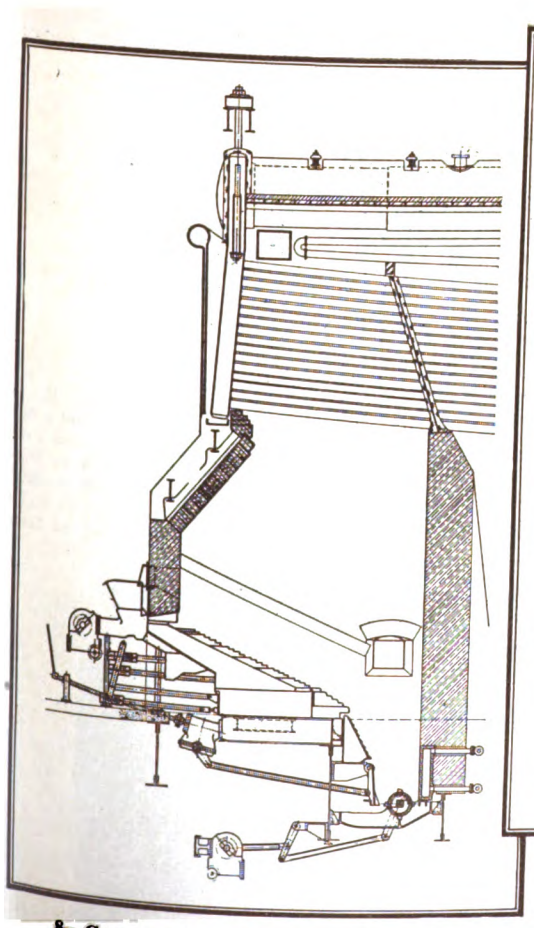
7—Stoker in Ford Motor Co. plant, Detroit, fitted with single-roll rotary ash discharge.

sudden call for steam for process purposes, as for example vulcanizing in the rubber industry, means an equally sudden peak which the boilers must take. The operator's problem in such cases is, as has already been stated, to deliver the steam. To accomplish that he must have an equipment that is highly flexible.

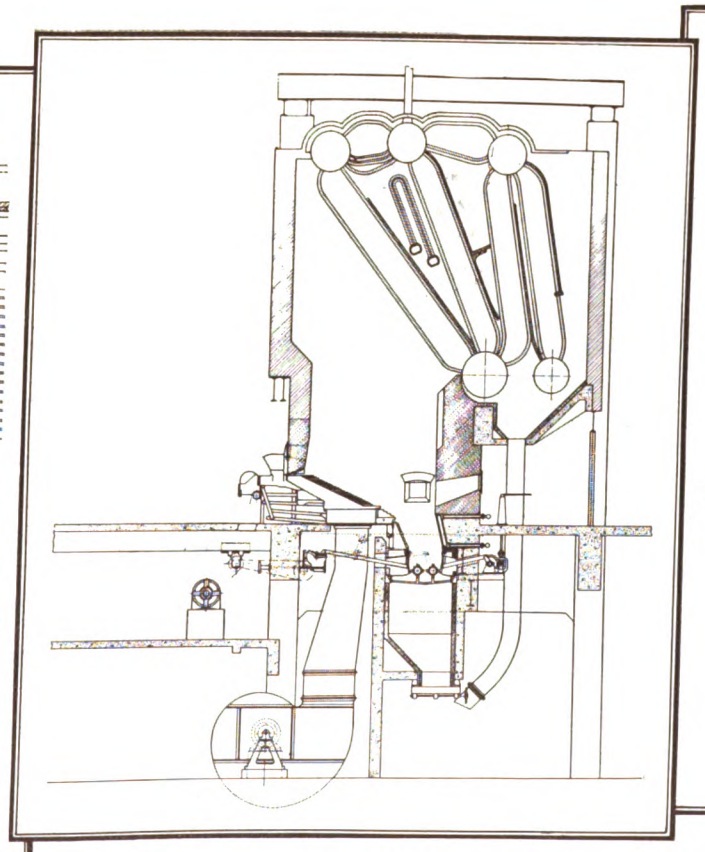
The elements which make for flexibility are the reserve capacity of the stoker and the ability to clean the fire quickly, easily and thoroughly and that the cleaning period should be variable at the will of the operator. The reserve capacity of the underfeed stoker is so well known as to call for little additional comment in this discussion. Suffice it to say, therefore, that the multiple retort stoker with its deep fuel bed provides in the greatest degree the first essential element.

The power dump is without exception the most satisfactory method of cleaning fires where conditions exist such as have been outlined. It gives the operator absolute control over his fire. He can, if necessary, increase the rate of coal feed to meet almost any contingency that may arise. Every operator knows that the question of capacity is largely one of the amount of grate

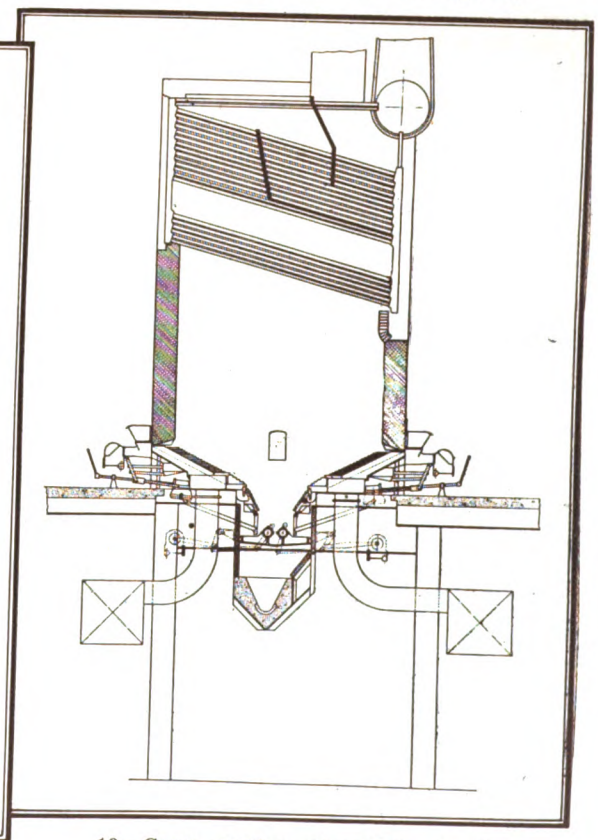
(Continued on Page 34)



8—Cross section of stoker with single-roll rotary ash discharge.



9—Cross section of stoker, single setting, with two-roll rotary ash discharge.



10—Cross section of stoker, double setting with rotary ash discharge.

Digitized by Google

An Annihilator of Distance

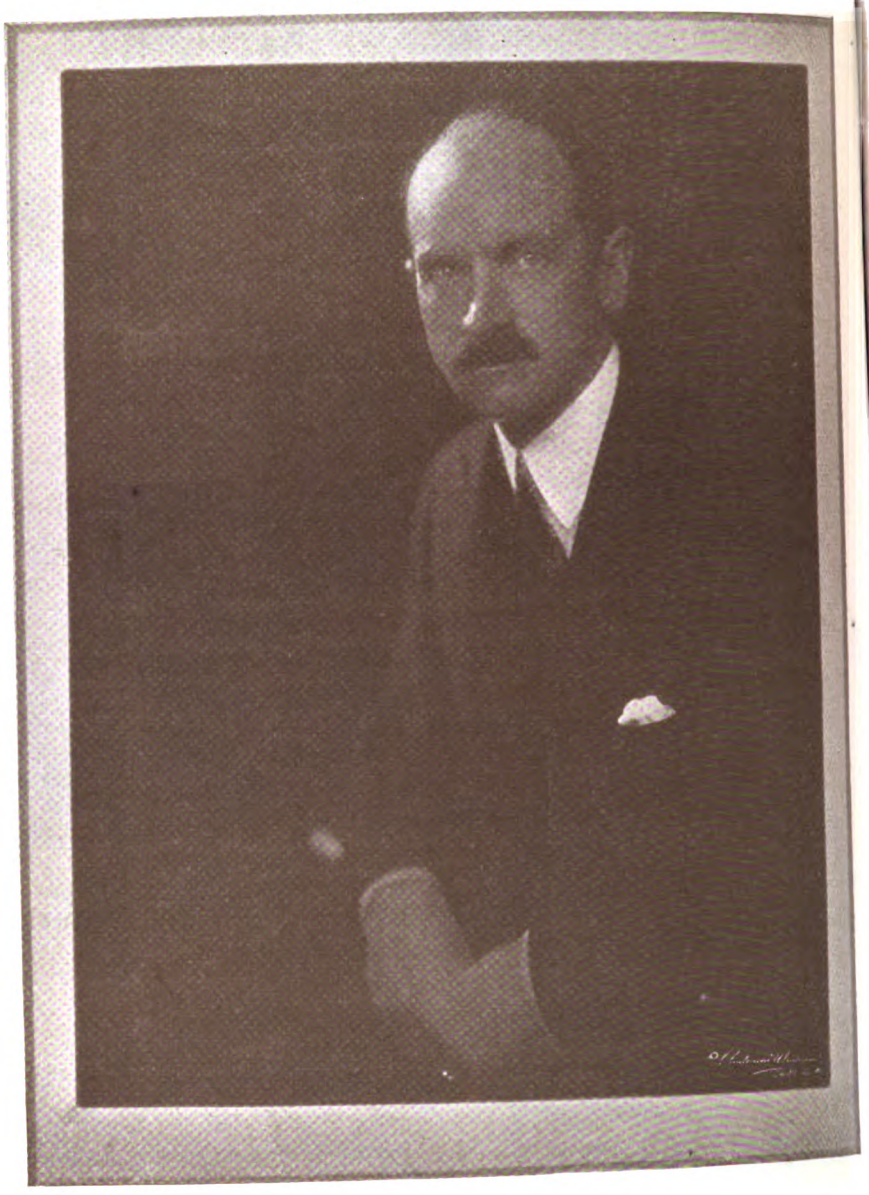
The Genius of Glenn H. Curtiss

By Ernest H. Rowe

PRE-EMINENTLY this twentieth century is the century in which the dreams of previous centuries are coming true; dreams so far from reality, some of them, that public opinion and science alike laughed them to scorn and burned the dreamers at the stake on the charge that they were demented or in league with the powers of darkness. The great Lord Francis Bacon began the new order by turning the brains of men about-face, changing the processes of thought from speculation to experiment, from the quoting of dicta to the observation of phenomena, from guess-work to actuality. Where he cleared the ground and laid the foundation the material structure of modern civilization is being reared, the mastery of nature is widening man's occupation of the empire which is his, according to the Psalmist: "Thou madest him to have dominion over the works of thy hands; thou hast put all things under his feet."

In groping fancy, with quaint device, those ancient inventors who dared the crushing public opinion of their time amused, amazed and sometimes terrified their contemporaries. Usually it meant their own destruction, either as the direct result of their attempts, or at the hands of the torturer and executioner. But the line of their succession was never broken, the torch that fell from their hands was never quite extinguished before it was

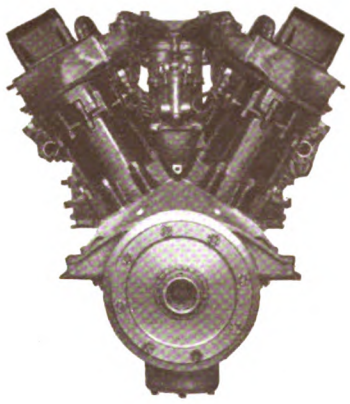
(*Continued on page 38*)

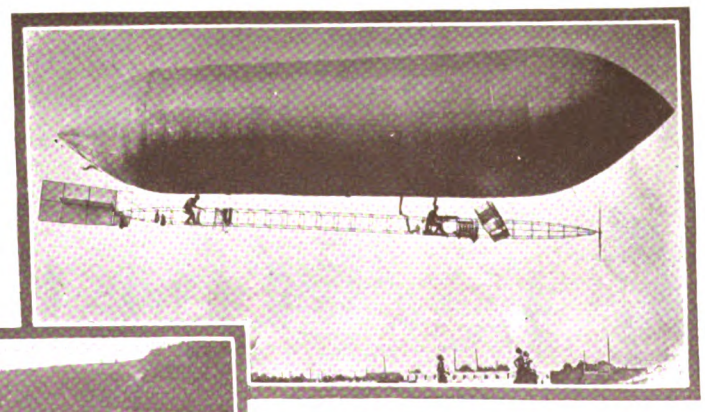


GLENN HAMMOND CURTISS

Faster, faster and ever faster, is the insatiable urge of his genius. Speed, distance, altitude—wheels, boats, wings—land, sea and sky—this twentieth-century, American Caesar has added their domains to the empire of man. He is still a young man, yet in less than half his lifetime he has quadrupled the speed of actual travel.

"Hitting on all twelve," this 400 h. p. Curtiss motor made possible the incredible speed record of the Curtiss-Army racing 'plane. Its weight is only 1¾ pounds per horsepower.





Curtiss made his first aeronautical motors for Captain Baldwin's dirigible balloon in 1905 and had his first taste of aerial flight in that manner. In the illustration at the left Curtiss is "forward" and Baldwin "aft."



Mr. Curtiss won the Scientific American trophy on July 4, 1908, by flying his first machine, "The June Bug," one kilometer straightaway under its own power. The first public flight in America.

He doesn't look it, but Lieut. R. L. Maughan, U. S. A., has just led, for a few minutes, the fastest life any man ever lived, 249 miles an hour at Detroit, September 25, 1922. Had he been fired from a cannon in Civil War days he would have traveled only twice as fast.

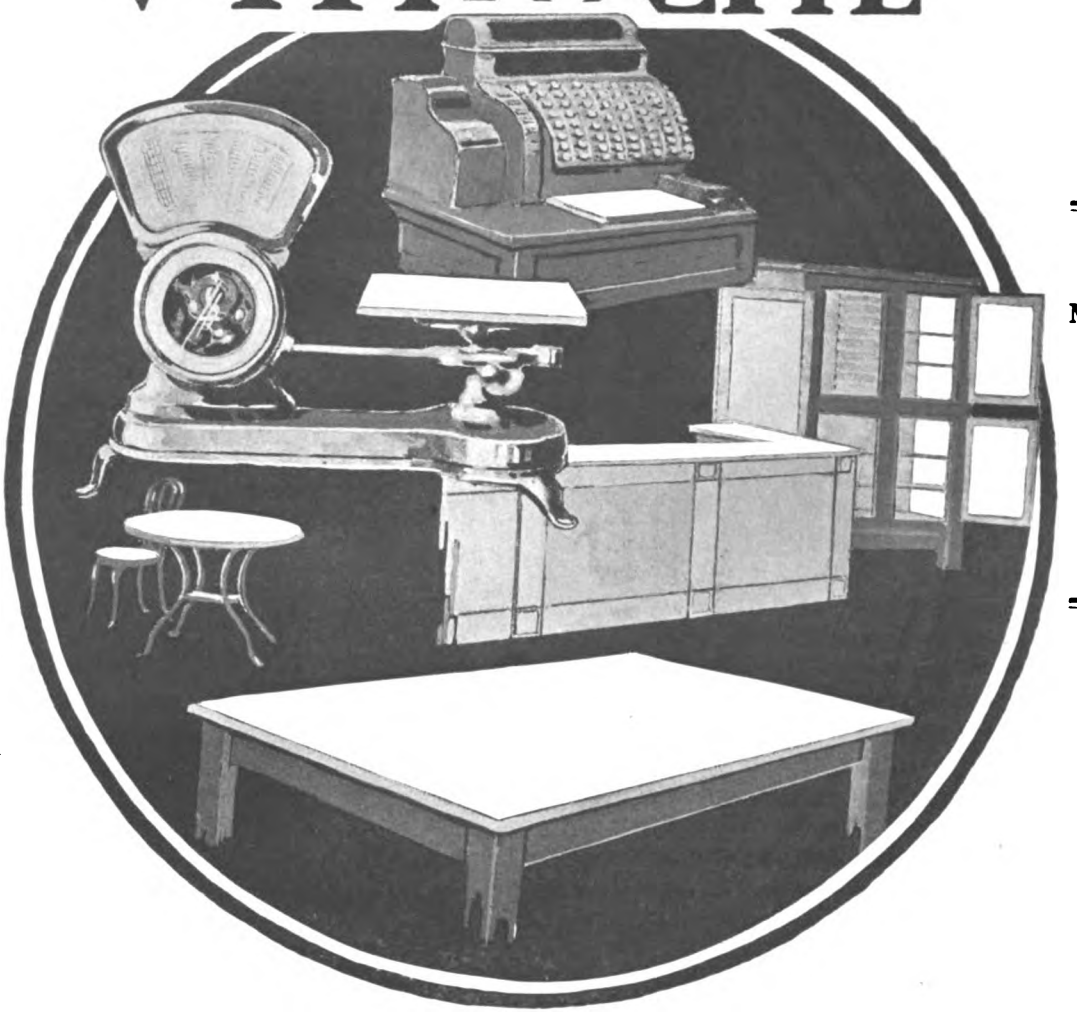


Digitized by Google

VITROLITE

Vitrolite Makes These Better

Display Fixtures
Hospital Furnishings
Ice Box Linings and Facings
Partitions
Scale Platforms
Shelves



Vitrolite Makes These Better

Soda Fountains
Surgical Instrument Table Tops
Table Tops
Bath Room Walls
Cabinet Shelves
Cash Register Shelves
Counters
Dental Slabs

A New Material You Should Know About

Many manufacturers of most important products in the country are using Vitrolite because it appeals instantly to the eye and it looks so wholesomely clean and white. It makes a new product look more attractive and preserves and maintains an unblemished appearance for years.

Vitrolite is stain proof — looks cleaner, whiter, and is more durable than marble. The strongest acids can't injure it—nor dust and dirt cling to its smooth surface—an occasional rub with a damp cloth keeps it spotless.

Buyers appreciate its longer service, too —for Vitrolite's tensile strength is 50% greater than that of marble. Wherever your product be judged by cleanliness, sanitation and durability it will be to your interest to use Vitrolite. It gives you all these sales advantages—plus a considerable reduction on manufacturing costs.

For many years Vitrolite has been the pioneer material for white restaurant table tops. But, thousands of manufacturers in other lines can use it for their products. Vitrolite will help increase the sales of many articles —the above list suggests a few. Your product may be among them—or if you manufacture a similar line, write and learn what Vitrolite can do for you.

A letter brings the details—send it today. Absolutely no obligation.

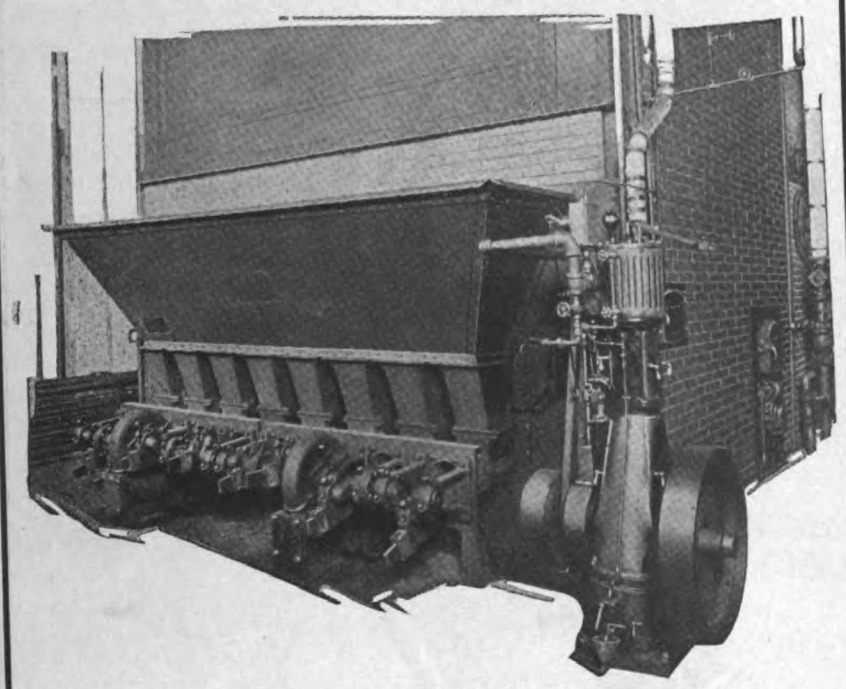
THE VITROLITE COMPANY

Chamber of Commerce Bldg., Chicago, Illinois.

Digitized by Google

TROY ENGINES

ONLY STEAM ENGINES GOOD ENGINES ONLY



Drive your Stokers and Fans with TROY Steam Engines

For continuous service, year in and year out, you can absolutely depend on the Troy steam engine. This rugged little engine keeps running faithfully over long periods. It carries the load with a regularity that is almost uncanny. In fact, in stoker operation, about the only time, you'll ever see one down is when they are cleaning the boiler, except of course, when packing is required.

Carefully balanced for smooth operation and minimum wear these dependable Troy engines are unexcelled for economy and close regulation.

Troy steam engines are used in the best plants for driving generators, exciters, stokers, blowers, fans and pumps, and are used in capacity up to 200 horsepower, in both horizontal and vertical type. They are built by specialists to meet your exact conditions. Our engineers will be pleased to consult with you.

Write for the Troy Catalog

TROY ENGINE & MACHINE CO.,

TROY, PENNSYLVANIA

Ford Foundry Practice at River Rouge

(*Continued from page 14*)

is necessary to trace them through step by step to learn what it is all about. Before we do this, however, just one word more about transportation as the key-note of foundry operation. In the ordinary foundry molds stand still and men take steps. It is true that in the usual foundry the molten metal must be transported to the molds and that the castings, after they are made, must be taken from the molding floors to the cleaning room, and thence to the machine shop, but the journey is by no means a continuous one. In the average foundry transportation is incidental rather than a key-note. The result of this is that one usually finds *departmentalization,* the presence of distinct and segregated core rooms, molding floors and cleaning rooms that have little in common.

At River Rouge with its key-note of transportation, departmentalization is subdued in spite of the fact that specialization is brought to its highest terms. The process is considered as a whole, starting with the core making, on through the molding, pouring, shaking out and the cleaning of castings. It becomes a *continuous process* instead of a disjointed succession of independent processes, a process knit together from start to finish by practically continuous conveyor transportation. This is true both for the heavy and light castings, and to understand the River Rouge methods one must leave the cupola line and its spectacular streams of flowing metal, go back to the embryo of all, the core, and follow this to the conclusion—to the finished, cleaned and glistening casting delivered at the machining department. For casting machining at River Rouge is considered a part of casting making, housed in the same building with core making, molding and cleaning activities and intimately connected therewith by conveyor transportation.

As typical of all other major operations at this foundry, let us follow the evolution of a Ford motor or tractor cylinder from core to clean casting. To do this we shall have to walk away from the cupola front down past one of the three-hundred-foot heavy mold systems, past the shakeout stations where the return molds are broken open and finally to the core making and baking stations.

Picture to yourself a double line of square core ramming tables surmounted by overhead sand galleries with core sand delivery spouts leading down to each table. Here the cores are rammed in metal boxes, placed on adjacent finishing tables, slicked and smoothed and wired by specialists who do nothing else and then placed on the suspended shelves of the pendulum conveyor which carries the finished cores away to be baked. Perhaps it is a cylinder body core which must be sprayed with core wash. If so, at the end of its conveyor journey the green core is lifted into a spray hood—a turntable affair divided into quadrants. Here it is sprayed with core wash by means of a compressed air spray gun. Next it is lifted and placed upon the shelf of one of the moving iron cabinets which travel continuously through the core ovens. A two-hour journey through one of these ovens subjected to the heat of gas produced at the Ford coke ovens, completely bakes the core. It is ready for the mold and goes to the molding systems on long apron conveyors.

To follow the operations in molding, we must start on one of the two outer lines of the heavy molding system at the opposite end from the cupola, and close to where our inspection of core making has terminated. As we look down one of these lines we see a line of molding machines, two batteries of six machines, each of the machines being spaced ten or twelve feet apart. The line of molding machies is parallel to the conveyor molding line and perhaps eight feet to one side of it. Over the top of the molding machines extends a sand gallery with its pendant spouts

Digitized by Google

leading immediately to each machine and so arranged that a pull will deliver sand directly into the flask.

The six molding machines at the origin of the conveyor system are used for ramming the drags or lower halves of the cylinder molds. Three men man each machine, ramming and setting gaggers and venting and slicking the half molds. As each half mold is finished it is lifted and placed upon the conveyor system to begin its journey toward the pouring station near the cupola. As it proceeds it passes various operators, each having a highly specialized duty. One of them places the housing core in position, another the port core, another the water jacket core and so on. One operator applies a templet to the core setting to make sure that the work has been properly done, another one sets the chaplets and another one tallies the drags. Each man has his special operation to perform and does nothing else. As a result the mold grows with marvelous rapidity.

By the time these operations have been performed, the steadily moving conveyor has brought the mold opposite the second battery of molding machines on which the copes or upper halves of the mold have been formed. Here also are three men to a battery and here the cope after being slicked and finished is inverted and placed upon the drag with its nest of cores. There remain now but a few more operations, such as placing the flask pins, clamping, wedging, ramming the runner boxes and backplates, each of which is progressively completed. By this time the last operation is finished and the mold has reached the pouring station where one-ton hot metal ladles, suspended from loops in the monorail system, spill their contents into the waiting sand cavity.

Thus the mold comes to the end of its up-journey. It is next slid over a transverse roller conveyor to the center or return track which runs between the two active outer lines and at twice their speed, thus caring for the output of both outer conveyors. On this return line, the poured molds travel under an exhaust hood which carries away their smoke and fumes and which surround the molds with cool fresh air. After some two hundred feet of this return journey has been completed, the casting has solidified sufficiently so that the runner block may be knocked off and pitchforked into a waiting back stock car. Twenty or thirty feet further an operator with a long iron bar lifts off the cope or top half of the flask, dumping it upon one of the shakeout gratings. The drag or lower half containing the red hot but solidified casting proceeds a bit further. Then a burly workman wearing a gas mask and armed with a sort of ice-tongs, seizes the red hot cylin-





World-known leaders in every branch of manufacturing are found on the list of Arex Installations:

Carnegie Steel Company
Packard Motor Company
Bethlehem Steel Company
American Steel & Wire Company
American Car Company
Ford Motor Company
Armour and Company
Standard Textile Products Company
Studebaker Corporation
Steward Mfg. Corporation
Sement-Solvay Company
Cadillac Motor Company
Sinclair Refining Company
Corn Products Refining Company
Crane Company
International Harvester Company
Kelly-Springfield Tire Company
Sherwin-Williams Company
Whitney Glass Company
Pullman Company
Whiting Plover Paper Company
Gilbert Paper Company
B. D. Rising Paper Company

Send rough sketch or blue print of building with data for engineer's analysis



You pay most for ventilation when you do without it

HAGGARD, drawn faces leaving the time clock after the day is done tell a story of costly neglect.

Men without fresh air *cannot* produce.

You can hire the best labor—adopt the most modern methods of production—offer every inducement to boost your plant's output, but when your men smother and choke because of improper ventilation, efficiency goes into the discard.

Arex Ventilating Engineers for more than fifteen years have been freeing industrial buildings of profit destroying conditions. They have counselled with the executives of every industry and can tell you an inexpensive and positive solution for any ventilating problem in your plant.

Use specification blank below to bring you a complete ventilation survey of your plant without cost or obligation. Attach rough sketch or blue print of building. Address Arex Company, Engineering Division, 1583 Conway Building, Chicago.

AREX COMPANY

J. C. Kernchen, Pres.

INDUSTRIAL VENTILATING ENGINEERS

Arex Ventilation Engineering Survey SPECIFICATION BLANK

We desire to receive *Gratis* an engineer's analysis of the following building: ..... *State character of work or business building is used for*

We are troubled with: Fumes ☐ Smoke ☐ Foul Air ☐ Heat ☐ Condensation ☐ Steam ☐

Dimensions of Building: Width .....Ft. Length .....Ft. Ceiling Height .....Ft.

Construction of Building: State whether Brick ☐ Concrete ☐ Frame ☐ Stucco ☐

Type of Roof: State whether Flat ☐ Slant ☐ Gable ☐ Sawtooth ☐ Monitor ☐

Pitch of Roof ..... State how many ..... inches to the foot .....

Location of Floor or Room to be ventilated .....

How high do adjoining Buildings extend over your Roof? .....

How many feet distant are the surrounding Buildings, or is your Building entirely unsurrounded? .....

..... Firm Name ..... Name of Individual ..... Title of Individual

..... Street Address ..... City ..... State

Digitized by Google

BUILT STRONGER LASTS LONGER

G-W MATERIAL HANDLING EQUIPMENT



G-W Ash Conveyor and Loading Hopper at Artic Hygeia Ice Co., New York, N. Y.

Automatic Ash Disposal Saves Time, Labor, Money

Every load of ashes trundled and loaded by hand means a waste of money.

Ashes that are automatically conveyed direct from the pits to wagon, truck or pile are handled speedily, efficiently—without the expenditure of a single cent in labor.

If you are still handling your ashes by the old hand method we would like to look over your plant and show you just how a G-W Ash Handling Equipment could save money for you. This equipment is made in many types and can be adapted to practically every ash handling situation.

A G-W representative will gladly bring complete information to your office or we shall be pleased to mail our descriptive catalog on request.

G-W Products

The Gifford-Wood Company specializes in elevating and conveying machinery for all lines of industry, including coal pockets, (wood, steel, concrete; rectangular, silo,) screens, hoppers, elevating and conveying equipment for ashes, stone, sand, gravel; pivoted bucket carriers, warehouse conveyors, portable belt conveyors, wagon loaders, car unloaders, friction clutches, hoists.

2112-R

Gifford-Wood Co. WORKS HUDSON N Y

NEW YORK-CHICAGO BOSTON-BUFFALO

der, lifts it by means of an overhead block and tackle, and swings it with skillful movement directly into one of the compartments of the hot casting conveyor which leads to the cleaning room mezzanine.

The sand from the cope and drag halves of each flask is dumped on the shakeout gratings. It falls through these gratings and down upon a conveyor that is located underneath the floor, and which carries this sand first to the sifting screens and next to the cutting machine, where some ninety percent of it is reclaimed. From these machines it goes via automatic transportation to the sand gallery thence to the molding machines, by way of the pendant sand spouts, repeating this cycle over and over again.

The hot casting conveyor carries its burden of glowing castings from the ground floor level to the cleaning mezzanine. As the castings arrive on the mezzanine, they are swung from the conveyor into cooling racks, each of which holds from thirty to forty cylinders. Here they cool some four hours. Racks which have become cool are picked up bodily by an overhead travelling crane, carried down the cooling bay and into a transverse runway, dropped upon lift trucks and hauled by tractor to the core sand cleaning stations, also on the mezzanine but in adjoining bays. Here the heavy chipping operations are performed by means of air hammers and the core sand is knocked out through a grating somewhat similar to that at the mold shakeout stations. The core sand falls upon a conveyor belt, passes through a magnetic separator which relieves it of wire and iron, goes to screening, cutting and mixing machines, and receives the necessary addition of new material, after which it is wheeled by truck along the core sand galleries over the ramming tables, to be used over again.

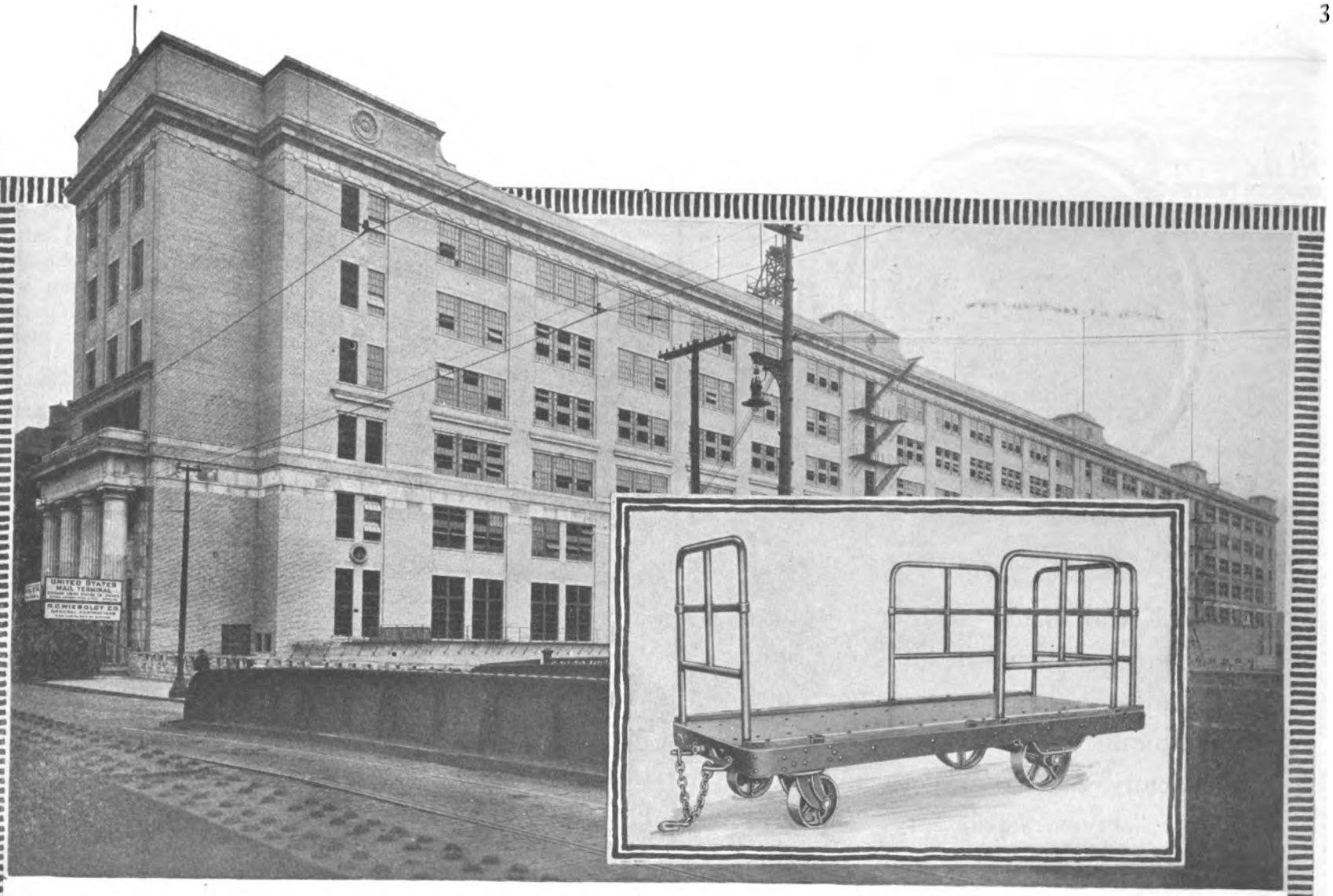
Leading down from the mezzanine are a number of very unusual and interesting conveyors, the links of which resemble somewhat the seats of swivel chairs, but which, in fact, are especially designed to receive the cylinders or tractor transmission frames that it is their duty to carry down to the tumbling barrels below the mezzanine. There are hundreds of these barrels at River Rouge, one hundred and ninety-two of them alone for the heavy castings, for the entire product of the foundry is tumbled. Each "swivel chair" conveyor leads past and around several units of tumbling barrels, eight barrels to a unit, feeding them and also carrying away their output. They carry the tumbled castings to the final apron flight conveyor adjacent to the machining department and, then their duty performed, make a return bend and climb back upwards to the mezzanine for a fresh load.

On the apron flight conveyor, the final operations of cleaning are performed. Here, too, the work is highly specialized, each man performing but one operation; it may be chipping a certain fin or testing the cylinder with a hammer for cracks. Finally, the last operation performed, the cylinder is led to the pile of castings "spotted" and ready for machining, which, by the way, is not a part of *this* story.

So much for the making of the Ford cylinders which is typical of all the rest of the operations at the River Rouge foundry. The light castings, of course, do not entail such a complex process but follow the same general line, starting with the cores, proceeding toward the cupolas, coming back again to the shakeout stations, then being cleaned and carried by conveyor to that portion of the machine shop fitted to machine them.

Probably after all, the pictures will tell the story better than could words.

Digitized by Google



The New Chicago Railway Mail Terminal uses more than a thousand K & J Trailer Trucks

On big installations, where carrying costs must be figured to the last notch—where the work to be done is so large that the effect of even very small shortcomings of equipment would be multiplied, through day in and day out service, into huge annual wastes—on installations such as this, "K & J" Trailer Equipment has demonstrated itself to be safest.

In this great, new Chicago Mail Terminal, over eleven hundred "K & J" Trailers and Trucks are being installed to meet the initial needs of this huge modern plant—a plant of national importance, designed for the quick, efficient handling of mails in this vital center of mail transportation.

The trailers, of the type shown, are of 4000 lbs. capacity, having a 36"x84" platform. Rear Wheels have individual axles.

These trailers are equipped with Hyatt Roller Bearings, with ball bearing caster swivels.

The experience developed by the "K & J" Organization, in meeting the exacting needs of such large installations through many years of truck and trailer building is, ample assurance of its unrivalled fitness for taking care of all classes of truck and trailer requirements, either large or small.

Write for Bulletin 510.

TRADE MARK

THE SEAL OF SATISFACTION K&J REG.

The Kilbourne & Jacobs Mfg. Co.

COLUMBUS, OHIO, U. S. A.

New York, 120 Broadway

Connections in all parts of the world.

Digitized by Google



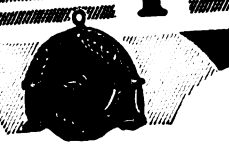
SERVICE SATISFACTORY

TALK with many experienced operators and you will find very little variety in the comments they have to offer on the behavior of Terry turbines. "Satisfactory Service," "perfectly satisfied" or "service satisfactory" seems to constitute the principal variety, and the comment from the American Printing Co. of Fall River, Mass., proves no exception to the rule. Though they have twenty turbines, some of which were installed as far back as 1916, the report shows "no shutdowns" and "service satisfactory." There are five turbines driving forced draft fans, one driving a duplex exciter four driving fuel oil pumps, five driving boiler feeders, and the balance are used for driving condenser auxiliaries and pumps for miscellaneous service. Let the comments of experienced engineers guide you, and for your next turbine requirement

Specify

T-798

THE TERRY TURBINE



Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co.
Terry Sq. Hartford, Conn. U.S.A.

Better Bundles at Less Cost

(Continued from page 17)

In the first place, it not only puts around the box a band of steel strong enough to keep the contents intact, even under rough handling which would otherwise split the boards or loosen the nails of a box not so reinforced, but permits a lighter and therefore cheaper box to be used. This also means the elimination of considerable dead shipment weight. In addition to tensile strength, which in the case of thirteen gauge wire is over 600 pounds, wire has other advantages: It cuts into the corners of the box, making it impossible to slip the band off, and when applied with the new machine the tie, consisting of three complete turns on each side or six twists in all, is stronger than the wire itself.

The machine is motor driven, both the tensioning of wire and the subsequent operations of twisting and cutting off being performed automatically. A box, for instance, is strapped with what is practically one continuous operation, as against a dozen or more different motions employed by other methods—fiddling with several different levers, hooks, ratchets, and so on, in order to apply one strap and get set for the next one. Moreover, the wire used for binding purposes does not have to be cut up into special lengths or otherwise specially prepared, but is drawn from the coil form, just as it comes from the mill.

A notable feature of the machine is its simplicity, as anyone can operate it without previous training or long practice. The operator merely places the wire in position, presses the foot treadle which puts the bundle under heavy compression, and the same operation lowers the tying mechanism onto the surface of the package. The wire is then passed around the overhanging end of the article to be tied and laid in the rotating tension drum, which immediately seizes it and draws it to the required tautness. The tension is necessarily adjustable, because a tension that a fragile container could not stand might be very desirable on a large, heavy box carrying heavy, bulky goods. Once the tension is determined and set by the operator, however, the machine will continue to pull each band to this exact degree of tightness indefinitely or until another adjustment is made.

When the required tension is reached in binding a package, the tension drum stops and the twisting mechanism is automatically engaged, making the tie and cutting off the ends in a fraction of a second. The ends are cut off close and at the same time turned towards the surface of the box. Thus, with the ends down entirely out of the way there is no chance for injury to the handlers of the packages and nothing to interfere with their even piling. Rigid back stops and side stops are provided for forming a corner into which loose pieces of board, shingles or similar material may be quickly and evenly stacked. These stops may be quickly moved by loosening two clamping screws with large wing nuts, while the machine is adjusted for height, when a change of package occurs, by the simple manipulation of two hand wheels on the over-arm.

Because of its rapid operation and convenience of handling the work, the machine saves time and reduces the labor item in tying costs very materially; the user pays for the machine but once, while labor must be paid for every hour. The cost of any article is, of course, the cost of using it. Wire is the cheapest tying material obtainable, costing now only about half as much per foot as common sisal or lath yarn. With this machine wire is used in its cheapest form directly from the coil, thus eliminating the waste and saving the expense of using specially prepared, cut-to-length, looped, knotted, twisted or notched pieces.

These machines may be used with any wire from 12 to 20 gauge. They will use Nos. 12, 13, and 14, or Nos. 15, 16, and 17, or Nos. 18, 19, and 20, without the necessity of making any changes whatever on the machine. This means that although a big strong wire may be required for large, heavy bundles, one can without loss of time change to a small gauge wire, giving many more feet to the pound, for small, light shipments.

Digitized by Google



THE COMPANY—We have been building nothing but tractors and trailors for more than eight years. If you care to investigate you will be surprised to discover how many of the most successful tractor-trailer installations are—100% "Mercury".

Announcing "The Trackless Train" Trailer

TYPE A-310

A CASTOR TYPE industrial trailer used by freight stations, marine terminals, warehouses, industrial plants, and suitable for any other work requiring a staunch, easy-running, well designed vehicle of this kind.

This trailer is the product of the experience of the pioneer, specialized trailer engineering talent, and complete manufacturing facilities.

There is not a single feature incorporated in the design that has not been thoroughly tried and tested by the relentless ordeal of actual service. We believe the A-310 to be the best all-purpose industrial trailer on the market. You will want to know more about this splendid vehicle.

Write for Trailer Bulletin A-100

Mercury Manufacturing Company

4118 South Halsted Street ***Chicago, Ill.***

A FEW OF THE MANY SATISFIED USERS OF MERCURY TRAILERS

STUDEBAKER CORPORATION .....South Bend, Ind.
BIRD & SON, INC.....Chicago, Ill.
KANSAS CITY COLD STORAGE Co....Kansas City, Mo.
PACIFIC MILLS.....Lawrence, Mass.
GENERAL ELECTRIC CO.....Pittsfield, Mass.
SEARS-ROEBUCK & CO.....Philadelphia, Pa.
C. B. & Q. RAILROAD.....Chicago, Ill.
PENNSYLVANIA RAILROAD.....Chicago, Ill.
REO MOTOR CAR CO.....Lansing, Mich.
SOUTHERN RAILROAD.....Pinners Point, Va.
NORTHWESTERN TERMINAL CO...Minneapolis, Minn.
BOSTON & ALBANY RAILROAD.....Boston, Mass.
BUTLER BROTHERS.....Chicago, Ill.
CHICAGO & ALTON RAILROAD.....Chicago, Ill.
NEW YORK CENTRAL RAILROAD.....Chicago, Ill.
SUGIMURA WAREHOUSE CORP.....Osaka, Japan

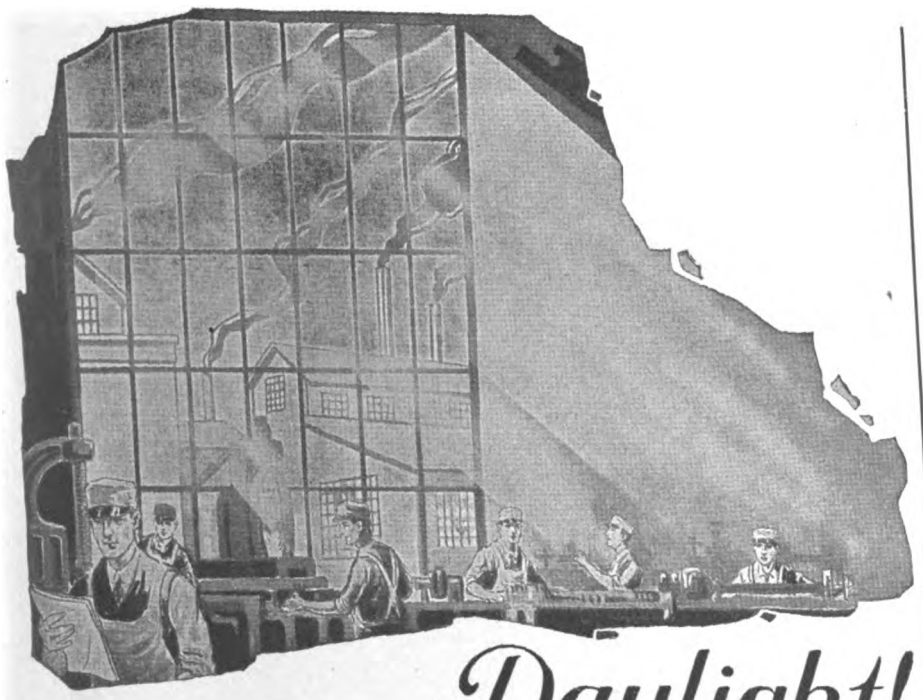
—and to pull the trailer —There is the Mercury Tractor offered in five distinct types and fifteen different models. (But that is a story in itself.) Write for Tractor Bulletin 103

CLYDE STEAMSHIP CO.....Charleston, S. C.
DALLAS BRASS & COPPER CO.....Chicago, Ill.
GREENVILLE COMPRESS CO.....Greenville, Texas
MEMPHIS TERMINAL CORP.....Memphis, Tenn.
WHITIN MACHINE WORKS.....Whitinsville, Mass.
WILSON & COMPANY.....Oklahoma City, Okla.
HAYNES AUTOMOBILE CO.....Kokomo, Ind.
LEHON COMPANY.....Chicago, Ill.
LEVER BROS. LTD.....Toronto, Can.
LYCOMING MOTORS CORP.....Williamsport, Pa.
MICHIGAN CENTRAL RAILROAD.....Detroit, Mich.
NORFOLK & WESTERN RAILROAD .....Roanoke, Va.
OLD DOMINION STEAMSHIP CO New York City, N. Y.
OWENS BOTTLE COMPANY.....Charleston, W. Va.
COMPANIA TERMINAL ATARES.....Havana, Cuba



THE FAMOUS MERCURY "L-TWIN" TRACTOR

Digitized by Google



Daylight!

Still the Best Factory Light

Daylight is still the best possible light—men who work in daylight produce more because they can see better.

SURLIGHT is a pure white interior paint which reflects practically all of the light that strikes the surface it covers. The soft rays of daylight diffused by this pure white paint will bring both work and machines into better, clearer relief—men can work faster when they are not under the tiring strain of poor and insufficient light. Spoilage is reduced, especially on precision work, because men more easily work to close gauges.

There is no glare to SURLIGHT—it does not blind or dazzle, but reflects daylight in soft, diffused rays that are restful as well as brightening. SURLIGHT is pure white and remains pure white during long years of service. It may be readily washed and its original tone and brilliance restored.

Sold in quantities direct to large corporation users only. Send for our De-Luxe SURLIGHT Book, a full treatise on the possibilities of this wonderful paint.

ST. LOUIS SURFACER & PAINT CO.
4202 Arlington Ave. St. Louis, Mo.

PAINTS FOR ALL INDUSTRIAL PURPOSES SURPACO

Trade-Mark

A Few Surpaco Products

Metalsteel (for all exposed metal), Surnamel (white), Surlac (shellac substitute), Surfspar (water-proof varnish), Surlino (linseed oil substitute), Building Paints and Varnishes

Special for Railroads
(Steam and Electric)

Metalsteel (for all exposed metal), Locomotive and Cab Enamel, Canvas Preserver, Canvas Roof Paint, Car Enamel, Car Floor Paint, Car Surfacer, Coach and Locomotive Varnish, Pole Paint (steel and wood), Seat enamel (rattan), Seat Varnish (rattan), Station and Building Paint.

Paint All Interiors with

SURLIGHT

The Light Reflecting Wall Paint for Industrial Purposes

Ash Discharge on Underfeed Stokers

(Continued from page 25)

area that can be installed under the boiler. 500 or 600% of rating is not beyond the point of possibility, provided the boiler can be stokered up to that point. But it would probably by uneconomical from a good many points of view because so seldom required.

The same output, however, can be temporarily attained with a much smaller stoker if the operator feeds the coal in at a high rate, burning off the volatile and discharging a large proportion of the coke. Naturally this would be a very wasteful operation, but when the operator is confronted with the necessity of delivering a certain amount of steam or facing a shutdown, probably it would be the less wasteful course to pursue. Of course, this is an extreme case. A capable operator seldom gets caught in a jam which would require operation of that character. But he frequently finds himself under the necessity of increasing his steam delivery 50 to 100 % or more without warning. Under such circumstances he must put more coal through the stoker even though by doing so, he may lose a considerable amount of unburned carbon.

As has been said, the power dump is probably the most effective method of cleaning fires to accomplish this purpose. It provides a variable rate of ash discharge that functions at the will of the operator. It requires the minimum amount of time to drop the dump plate, so that the accumulation thereon may fall into the ash pit, and return the plate to its normal running position. A glance at the accompanying illustrations will show that it is easily possible to perform this operation in less than half a minute. The writer has studied a considerable number of steam flow meter charts of operation carried on at extremely high rates but with considerable fluctuation. It is especially noteworthy that in such operation there is practically no interruption to steaming as the result of the dumping period.

The power dump, therefore, provides the element which enables the operator to clean his fires quickly, easily and thoroughly, with absolute control over the dumping periods. Hence it is well established that for operation which involves considerable fluctuation, the power dump is the most desirable type of equipment for cleaning fires.

In the second class of operation the problem is entirely different. With a fairly constant load, the operator seeks, naturally, to operate his plant at the point of maximum efficiency. There is comparatively little need for the ability to clean fires instantly. Rather, there is urgent need for as nearly as possible, clean fires at all times. The ideal way to maintain clean fires is to discharge the ash as rapidly as it forms—in other words, by means of continuous ash discharge at a rate proportional to the rate of combustion.

The most practical and satisfactory device for accomplishing this result is the rotary ash discharge which has been brought to a high state of perfection.

The various illustrations in this article will indicate that one of the essential features of the rotary ash discharge is a deep ash pocket. This pocket must not be regarded as primarily a storage place for ash. If that were the only requirement, an ash pit would probably answer the purpose.

It is extremely difficult to handle hot ash. After the ash has become cool, it can readily be broken up and discharged. The ash pocket serves as a space in which ash may be treated or conditioned for discharging. The conditioning of the ash involves the final burning out of any combustible which it may contain after it leaves the stoker proper, and the cooling of the refuse.

To provide for this the ash pocket is divided horizontally into two sections. The upper section is flanked by a grate somewhat similar to the extension grate of the stoker itself. This is known as the lower extension grate. It is provided with ports through which air

(Continued on page 37)

Digitized by Google

NORDBERG-CAREL'S DIESEL OIL ENGINES

BURN LOW GRADE FUEL OIL

Nordberg Two-Cycle Diesel Engines show remarkable economy over any other prime mover. The Nordberg Co. has installed upward of 38,000 horsepower, operating with the lowest grade of fuel oil, which can be handled successfully only with the two-cycle engine.

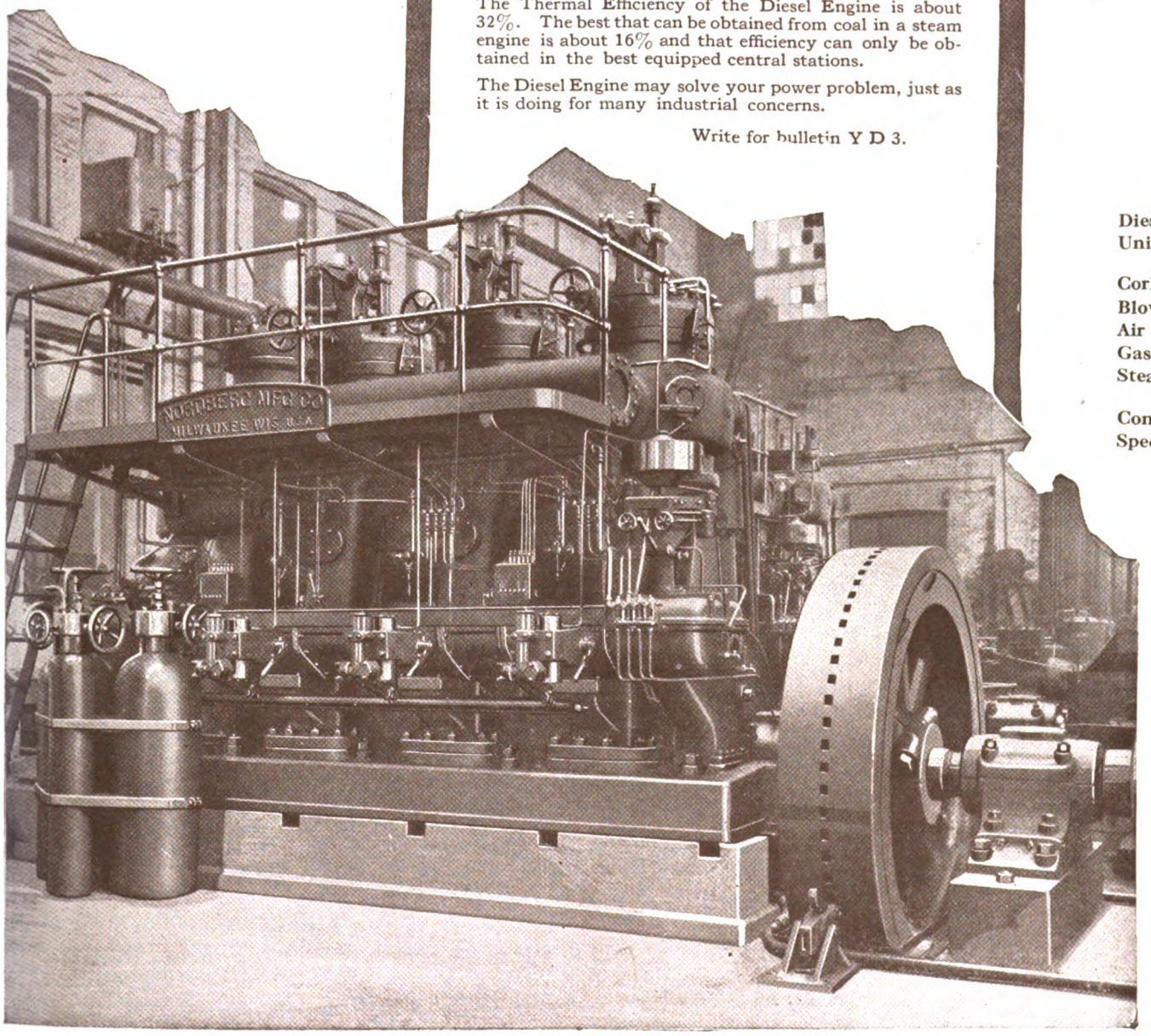
Nordberg Diesel Engines are used to drive the following diversified types of machinery:

Electric Generators
Air Compressors
Centrifugal Pumps
Plunger Pumps
Ice Machines
Line Shafting

The Thermal Efficiency of the Diesel Engine is about 32%. The best that can be obtained from coal in a steam engine is about 16% and that efficiency can only be obtained in the best equipped central stations.

The Diesel Engine may solve your power problem, just as it is doing for many industrial concerns.

Write for bulletin Y D 3.



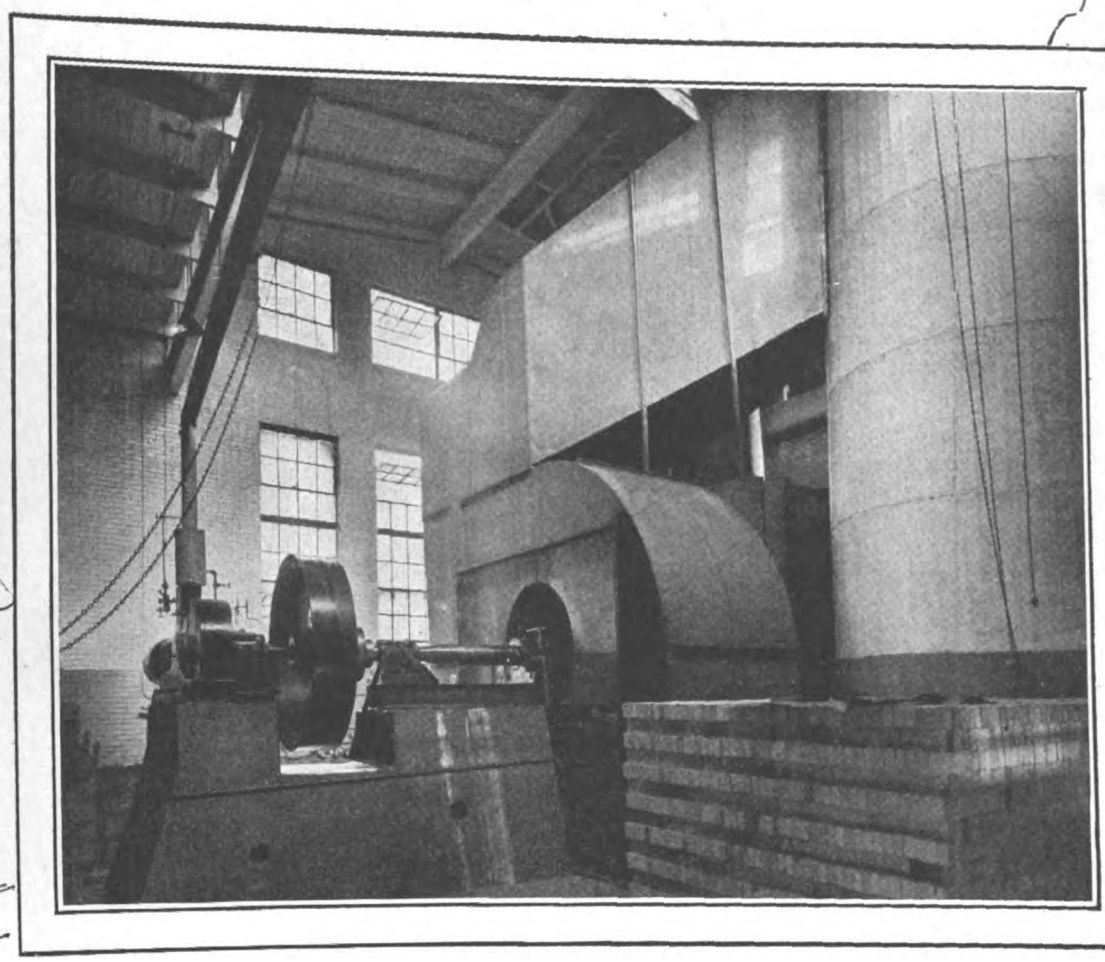
NORDBERG
MACHINERY

Diesel Engines,
Uniflow-Poppet Valve Engines,
Corliss Engines,
Blowing Engines,
Air Compressors,
Gas Compressors,
Steam, Air and Electric Mine Hoists,
Condensers,
Special Machinery.

NORDBERG MANUFACTURING CO.

MILWAUKEE WISCONSIN

Digitized by Google





American Blower induced draft system in the plant of the Michigan Carton Company, Battle Creek, Mich.

Induced Draft System Makes Possible a Saving of Thousands of Dollars— Cheaper Coal is Burned

Ample power, though cheaper, poorer grades of coal are burned, and a most noticeable reduction in the cost of arch and boiler tube repairs are a certainty in power plants where American Blower Induced Draft Systems are in operation.

Frequently the saving effected totals thousands of dollars each year.

Evidence of huge savings come to us from power plants in all sections of the country where American Blower Induced Draft has replaced ordinary methods.

The following statement by W. I. Fell, President of the Michigan Carton Company, Battle Creek, Michigan, is typical:

"When we could burn only the better grades of coal, fuel shortages frequently forced us to stop half our cardboard machines and lose 40 or 50 tons production per day.

"Eighteen months ago we installed the American Blower Induced Draft System and saved many thousands of dollars lost through such production tie-ups because it enabled us to get ample power with poorer, cheaper coal without any difficulty.

"Formerly, even when we had the coal, our seven boilers (of 25,000 total horsepower) had to be forced very hard and 'bottled heat' resulted in arch repairs costing some $2,400 a year and tube repairs of $800 more.

"The American Blower System cut our arch repairs 75% and tube repairs 90%—thus saving us enough in repairs alone to pay its total operating cost, including interest, depreciation and power.

"In 24 hour service, 6 days a week, for a year and a half it has given us great satisfaction and required no attention but lubrication.

"With this equipment we get higher efficiency out of our coal, develop more power, save thousands in costly shutdowns and avoid $2,500 of troublesome arch and tube repairs."

Write today for our latest bulletin describing American Blower draft equipment, both forced and induced.

AMERICAN BLOWER COMPANY, DETROIT
BRANCHES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO

199)

American Blower

"Sirocco" TRADE MARK

EXHAUSTERS · VENTILATING FANS · AIR WASHERS · BLOWERS · ENGINES

FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

Digitized by Google

(Continued from page 34)

may be admitted in any desired quantity. The combustible which remains in the ash after it reaches the pocket continues to burn while in this section and until it passes below the bottom of the lower extension grate. This results in reducing to a minimum the combustible in the final residue and, therefore, in increased combustion efficiency.

The lower portion of the pocket is flanked by cast iron plates known as crusher plates. These provide a surface against which the clinker can be crushed. In all double set arrangements of the stoker there are crusher plates on each side of the pocket. This is also true of single set arrangements where two crusher rolls are provided. When only one crusher roll is used, the crusher plate is on the stoker side of the pocket and the bridge wall side is lined with a rigid cast iron plate.

The crusher plate is movable so that the gap between the plate and the roll may be adjusted to any desired width. This provides for crushing the clinker to any size suitable for easy handling by any ash disposal system. It also permits a certain degree of variation in the rate of ash discharge although this is a secondary function. Finally, it provides a means whereby the ash pocket may be emptied when the stoker is off the line for cleaning or overhauling. The accompanying illustration of one of the furnaces at the Syracuse plant of Solvay Process Company shows one section of the crusher plate in running position, while the other sections are wide open.

The crusher rolls are the operating element of this system of ash discharge. They consist of cast iron shells mounted on a steel shaft which has a square cross section. The shells are built up in sections for convenience and are armed with teeth that have a triangular cross section. These teeth are made of special cast iron which is very durable and are made removable for ready replacement. The design of the teeth is such as to provide the maximum crushing force with the least strain on the rolls or mechanism.

The rolls may be operated by the stoker drive or independently as desired. In either case provision is made for varying the speed of the rolls independently of the stoker so that the operator may regulate the proportionate rate of ash discharge. In all two-roll arrangements, the rolls are made to rotate away from each other at the top, while in the single roll arrangement, the roll rotates toward the stoker.

The advantages of the rotary ash discharge system are:

First: It provides a space in which combustible may be consumed to the ultimate degree,

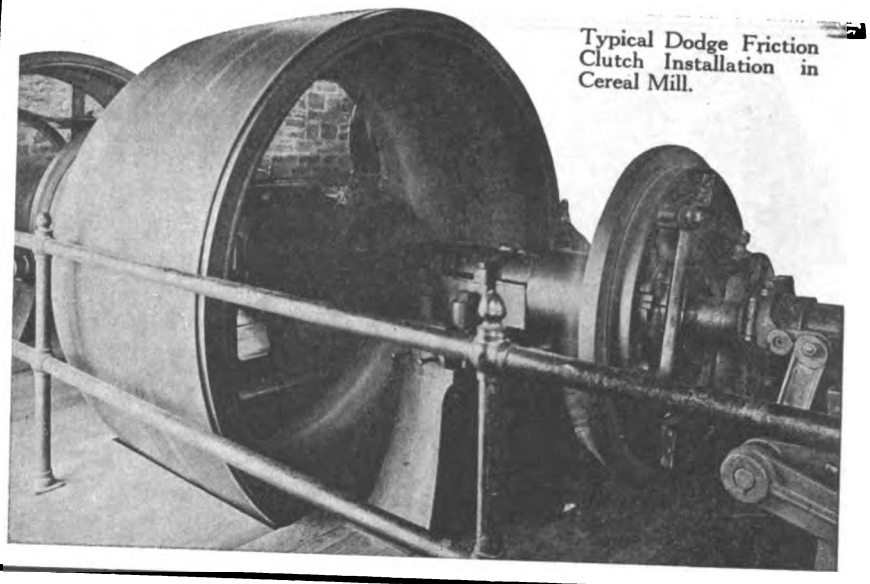
Second: It provides a space in which the ash may be cooled,

Third: It provides a means whereby the ash and clinker may be continuously crushed and discharged, and

Fourth: It insures practically constant furnace conditions.

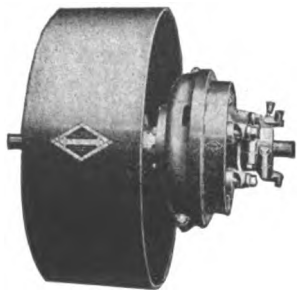
Approximately 300,000 rated boiler horsepower has been equipped with stokers using this rotary ash discharge system. The operation of these plants has been closely watched and frequent reports have been received as to the results obtained. Not the least important result is that with this system, stoker operation is reduced practically to supervision alone.

A good many well authenticated cases are on record in which the increase amounts to two or three percent or more. The average amount of combustible in the refuse amounts to less than ten percent. And the ability to burn out fuel to so great a degree naturally results in a considerable saving in that direction.



Typical Dodge Friction Clutch Installation in Cereal Mill.

How Much of Your Power is Driving Idle Machinery?



Dodge Split Friction Clutch with Dodge Split Iron Pulley mounted on sleeve.

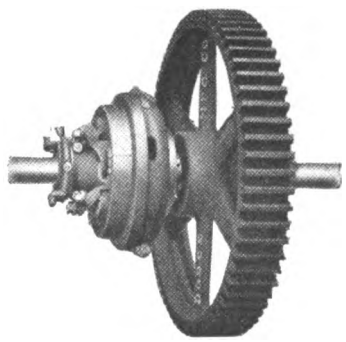
If you are now paying for power that is not doing productive work—if your entire plant or any department is at the mercy of one machine breakdowns, you cannot afford to ignore the advantages of a Dodge friction clutch installation.

A department, lineshaft, countershaft or individual machine may be instantly cut out from any other part of your power transmission system and your losses due to idle men and interrupted production reduced to a minimum.

The value of individual control of machines, groups and departments in the saving of power, time and expense is best appreciated by the executive who has witnessed a complete shutdown, men idle and production stopped because of an accident to belt pulley or shaft.

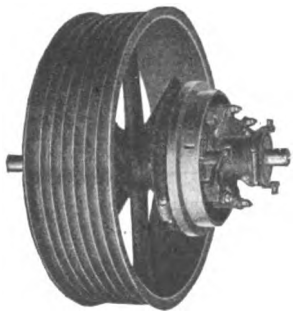
The cost of one such accident will pay for a Dodge friction clutch installation and the savings effected will prove that these clutches are the most consistent dividend payers in your plant.

Thousands of Dodge clutches have paid for themselves during their first year of operation—thousands of satisfactory installations in all industries back your judgment when you specify them for your factory.



Dodge Split Friction Clutch with Dodge Spur Gear mounted on sleeve.

Dodge friction clutches, as well as pulleys, hangers, bearings, pillow blocks, collars, couplings, etc., can be purchased from your local Dodge dealer on the immediate delivery basis.



Dodge Split Friction Clutch with Dodge Sheave mounted on sleeve.

Our special clutch bulletin gives full particulars—write for it.

DODGE

Power Transmission Machinery

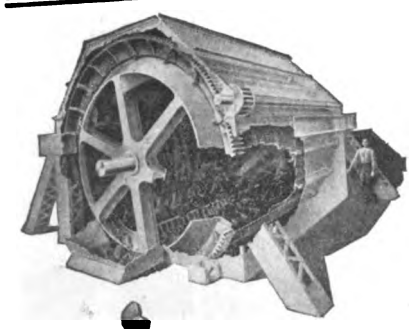
Dodge Manufacturing Corporation

General Offices: Mishawaka, Indiana Works: Mishawaka, Indiana, and Oneida, N. Y.

Dodge Manufacturing Company of Canada, Ltd., Toronto and Montreal

New York	Newark	Minneapolis	St. Louis
Boston	Atlanta	Houston	San Francisco
Philadelphia	Cincinnati	Seattle	Chicago
Pittsburgh			

Digitized by Google





Is Tramp Iron a Menace in Your Coal Handling?

"Pennsylvania" Bradford Breakers and Hammer Crushers automatically and accurately sort out the tramp iron during the crushing operation, preventing damage to crushers, and stokers, without extra power or upkeep.

In addition, "Pennsylvania" Bradford Breakers automatically remove the harder impurities including, slate, bone, rock, sulphur balls and mine props, together with the tramp iron, while preparing Bituminous coal for Stokers, By-Product Coking, Gas Making and preliminary to pulverization for Powered Fuel Plants.

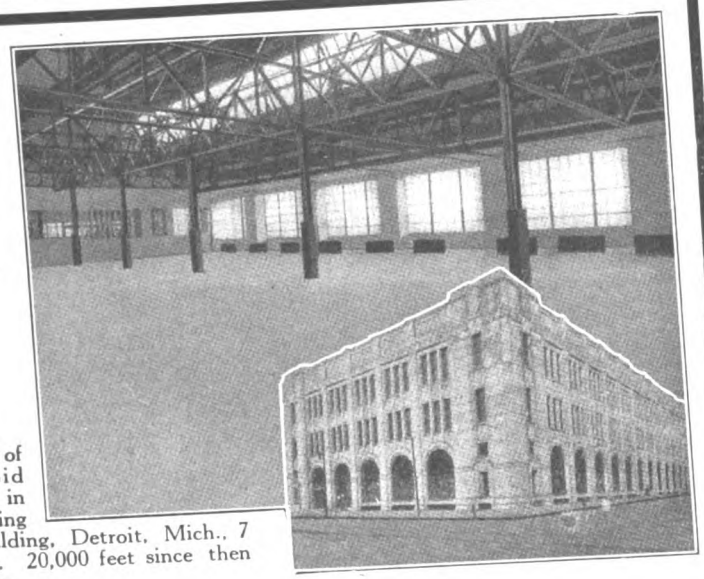
We have brought the right solution to many coal preparation problems, and are ready to cooperate on receipt of your suggestion.

Ask for Bulletin 6001

PENNSYLVANIA CRUSHER COMPANY

1320-1325 Stephen Girard Bldg., Philadelphia, Pa.

Fireproof
Non-Abrasive
Resilient
Warm
Permanent
Sanitary
No Upkeep
Attractive
Economical



30,000 feet of Marbleloid installed in the Evening News Building, Detroit, Mich., 7 years ago. 20,000 feet since then on re-order.

Use the coupon below to bring you information about this flooring for Offices, Hospitals, Cafeterias, Welfare Rooms, Laboratories, Libraries, Display Rooms, Workrooms, Power Plants and other rooms in industrial plants.

MARBLELOID
The Universal FLOORING for Modern Buildings

The material is manufactured and the floor is laid in seamless plastic form by our organization. The responsibility is not divided, therefore we guarantee the floor in every way.

THE MARBLELOID CO., Eighth Ave. and 34th St., New York

THE MARBLELOID COMPANY, New York City: Without obligating myself in any way, please submit tentative estimates on the cost of your product installed complete for our building.....; below are the approximate areas involved.

Floor.....Sq. Ft. Sanitary Base.....Lineal Ft.

Wainscot.....Sq. Ft. I have checked the floor troubles we now have.

Our floors are
[ ] New Concrete [ ] Cement Finish [ ] Wood
[ ] Cracking [ ] Cold [ ] Slippery
[ ] Dusting [ ] Splintering [ ] Unsanitary
[ ] Noisy [ ] Rough [ ] Rotting

Name .....

Firm .....

Address.....

[ ] Please send 32-page Illustrated Booklet

An Annihilator of Distance

(*Continued from Page 26*)

snatched up and passed on until, in the field before us at the moment, it was carried upward higher than Everest, unstopped across oceans, and again at four miles a minute. The very city of old Lisbon which with incredulity saw de Gusmao send a globe weighing but a few ounces to the ceiling with heated air, greeted with acclaim six men who came on wings out of the west in a 14-ton boat marked N for the Navy of a nation unborn in de Gusmao's time, and C for Curtiss, whose very ancestors had not yet left Europe for the new land, built in large part of materials, and driven by fuel and machinery, the eye of man had never seen. It was of such stuff as only dreams were made of, then.

All that has been said may be put inversely this way: the achievements of today have their roots in the past, each step in the conquest of nature grows on the imagination, the researches, the experiments, the developments of men who have gone before. Mostly it is by toilsome, short steps. Then once in a generation, or a century, or a millenium, there comes a man who in one leap covers more ground than all who have gone before him. Such a man is Glenn Hammond Curtiss.

The study of aeronautics was not born with Curtiss. No one can state more plainly than he his indebtedness to his forerunners all the way from the ancients to his contemporaries. But what otherwise was still scientific study, Curtiss' genius and skill advanced and converted into a practical device, enabling man to function in a new element, so thoroughly at will that, without the necessity of waiting for the slow processes of evolution to adapt him to the enlarged environment, already it has annihilated a large part of the physical limitations which have circumscribed man's contact with his world from the beginning. Curtiss works with appliances rather than problems, he thinks in terms of areoplanes instead of areonautics, he doesn't set his answer down on a piece of paper —he sets it up in the shop. That has been his characteristic since boyhood.

It was never mere tinkering, because he made things work. A couple of tomato cans in his hands became anything from an acetylene gas generator to a carburetor on a motor-cycle's engine. Steadily his experimental genius and mechanical skill were developed through years of handicraft, his business acumen through as many years of wresting a living from the world. His schooling ended with graduation from high school, with a practically perfect record in the final examinations. He would say his education is not ended yet. With his quest for knowledge, it never will be.

Curtiss' working days began in the Eastman kodak factory in Rochester where he took advantage of his surroundings to learn photography. Owing to the habits then formed, there is forunately photographic record of practically every event of interest in his development of the airplane. In his spare time he did odd jobs of many sorts which called for his mechanical turn of mind and hand. Among other things, he repaired bicycles. When his family moved back to Hammondsport, where Glenn was born on the 21st of May, 1878, he put this practice into good use by opening up a bicycle repair shop. He was then not quite twenty years of age. Probably it was at this time, if it is possible to fix a time, when the urge for speed, more and greater speed, seized upon Curtiss. He did some racing, but had not the physique of a winner.

But what he lacked in the legs he had in the brain. In 1901 his head was saving his heels by contriving a gasoline engine built with his own hands so small that he could fasten it to his wheel. The tomato cans figured in it. Ideas came "out of the air," as Wagner said his musical themes came. Standing one day, chatting with a friend, he was idly and absentmindedly twisting the handle of his "bike." But the absent mind wasn't wool-gathering; suddenly it struck home with an idea—the handle control, familiar today in all motorcycles. Of course the "contraption" young Curtiss built had to be laughed at, and had

(*Continued on Page 40*)

Digitized by Google



It is no great trick to lay a "Cementile" Roof. Our own crews do this work, but only because it is our policy to be certain at all times that every roof is put down absolutely right.

Bonanza "Cementile" improves with time, requires little or no attention, is rust proof, weather proof, fire proof.

One of the economies of a Bonanza "Cementile" Roof is in laying it. No special supports are needed. The tiles, made of steel reinforced concrete, are laid directly upon the purlins. With practically every other style of more or less permanent roofing another roof of wood must be used or else special braces of some kind. "Cementile" Roofs dispense with all these costly expedients. The purlins upon which the tile are laid would be required no matter what kind of roofing material was used.

You'll be interested in the facts about Bonanza "Cementile" Roofs set forth in our descriptive catalogue. Send for it today.

BONANZA—CEMENTILE

American Cement Tile Manufacturing Co.

831 Oliver Building, Pittsburgh, Pa.

PLANTS: Wampum, Pa. Lincoln, N. J. · Birmingham, Ala.

OFFICES: Pittsburgh · New York · Philadelphia · Cleveland · Birmingham

Bonanza "Cementile" is a reenforced cement tile roofing, with a pleasing outer surface, laid directly on the roof purlins. It is light, but very strong in structure, and absolutely fireproof and waterproof. Made for flat or pitched roofs, new or old.

CEMENTILE

The first cost of a Bonanza "Cementile" Roof is the last cost. We make and lay the roof, and unqualifiedly guarantee the material and labor.



Digitized by Google



FORCE tramps and hangers-around to build their "cold night" fires a safe distance away from your factory buildings.

An impregnable, unclimable Anchor Post Fence would provide an unfailing barrier against these dangerous intruders and give you year-round protection.

Insure now against "cold night" fire risk and all other trespasser dangers. Call in an Anchor Post practical man. He will be primed to tell you all about the Anchor Post Fence that will exactly meet your needs.

For quick service write, phone, or wire the nearest Anchor Post office or agent.

ANCHOR POST IRON WORKS
52 CHURCH STREET, NEW YORK, N. Y.

Branch Offices

Boston, Mass. . . 79 Milk Street
Chicago, Illinois 8 So. Dearborn St.
Cincinnati, Ohio 141 East Fourth St.
Cleveland, Ohio Guardian Building
Detroit, Mich., . Penobscot Bldg.
Hartford, Conn. . 902 Main Street
Mineola, L. I., N. Y. 167 Jerico Turnpike
Philadelphia, Pa. . . Real Estate Trust Bldg.
Pittsburgh, Pa. . . . 541 Wood St.
Rochester, N.Y. 1604 Main St., East

Agents in other cities

FIRM—BECAUSE THEY ARE ANCHORED
Anchor Post Fences
PERMANENT—BECAUSE THEY ARE GALVANIZED

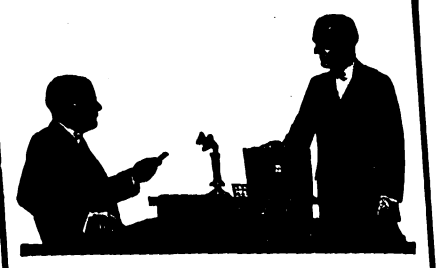
(Continued from Page 38)

to stand a test by racing with the fellows who could get real speed out of a bicycle. They laugh about that race yet in Hammondsport. Ten years later there was a bigger laugh about a bigger contraption of Curtiss', a laugh which likewise suffered a reverse overnight. Which way? The same guess will do for both laughs.

Curtiss wants physical speed, and he goes at it with mental speed. In two years he was entering motor-cycle races in New York on his own machines, and experiencing the thrill which comes from winning. And in another year, 1904, his racing engagements had taken him as far as Ormond Beach, Florida. On January 8 of that year, with a two-cylinder machine, he made a ten-mile record which stood unbeaten for seven years—8 minutes, 54 2/5 seconds. Three years later, at the same place, on a motor-cycle weighing only 110 pounds, he rode a mile in 46 seconds and with a so-called freak machine—a two-wheeler equipped with an 8-cylinder motor and weighing 350 lbs. he rode the fastest mile man had yet traveled, in 26 2/5 seconds. That is at the rate of 137 miles an hour! Curtiss' desire for speed is not taken out in mere longing; he goes after it, and he gets it. Over and over again has he had the sensation of whizzing through space at a pace which no man before him ever experienced. More than that, he has done it, not as a mere sportsman putting somebody else's device through its paces; he has done it always with a vehicle conceived by his own brain, wrought in his own shop, largely with his own hands. Do you often find a personality so self-contained as that?

Had Curtiss' career followed the history of the race, his next step would have been the automobile. But, curiously, his development skipped that next link in the chain of vehicular speed. It was natural enough, however. Captain Thomas Baldwin, the famous aeronaut of the United States Army Signal Corps, in 1905 was working on a dirigible balloon. The lightness of Curtiss' motor-cycle motor attracted his attention and he asked Curtiss to make one on a scale large enough to serve as the

(Continued on page 43)



"IT'S YOUR ORDER, Because Your Company Has a PHOTOSTAT."

"This is a job where delivery is paramount. And, in every case, I have made it a point to find out what kind of equipment the bidder had in order to make good his promise.

"Your Company has a piece of equipment on which I have learned to rely. I know what the PHOTOSTAT is and what it can do. I know you will not have to lose any time tracing. You can make PHOTOSTAT copies and get started on your shop work right away. In other words you'll be days ahead and I also know that there can't be any mistakes in PHOTOSTAT copies.

"Yes, sir, you tell your chief he can thank the PHOTOSTAT for this order. I know you'll make delivery with that machine to help you."

PHOTOSTAT prints cost cents. Compare this with what it costs for a draftsman to make a tracing, a stenographer to copy a page, or an artist to reproduce a layout.

The experiences of many users, written in letter form, are contained in our booklet, "A Good Word for the PHOTOSTAT." Write for your copy today.

PHOTOSTAT CORPORATION
295 STATE ST., ROCHESTER, N. Y.

88 Broad St., Boston
123 W. Madison St., Chicago
209 Leader Bldg., Cleveland
7 Dey St., New York City
510 Nat. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington

Executive Office: Providence, R. I.

PHOTOSTAT
Trade Mark

Digitized by Google

Proving Its Power Savings
Side by side you find them

In tests in service, in power plant after power plant, where results in economy and reliability are recorded day by day for a long period of time, you find the highest endorsement for the Fulton-Diesel. Side by side you find them—performance of one leading to the purchase of another.

The Fulton-Diesel is thus established by putting to practical service the wonderful fuel and labor-saving principle of internal combustion with low-grade fuel oils. A typical case is a plant in one of America's most progressive cities. Two 550-horsepower Fulton-Diesels were installed in 1914. They were thoroughly tested for two years. When in 1916, the growth of the city made necessary an additional power unit, a third Fulton-Diesel of the same capacity was bought. The three today are successfully performing as did the first two.

And coal has been no problem.

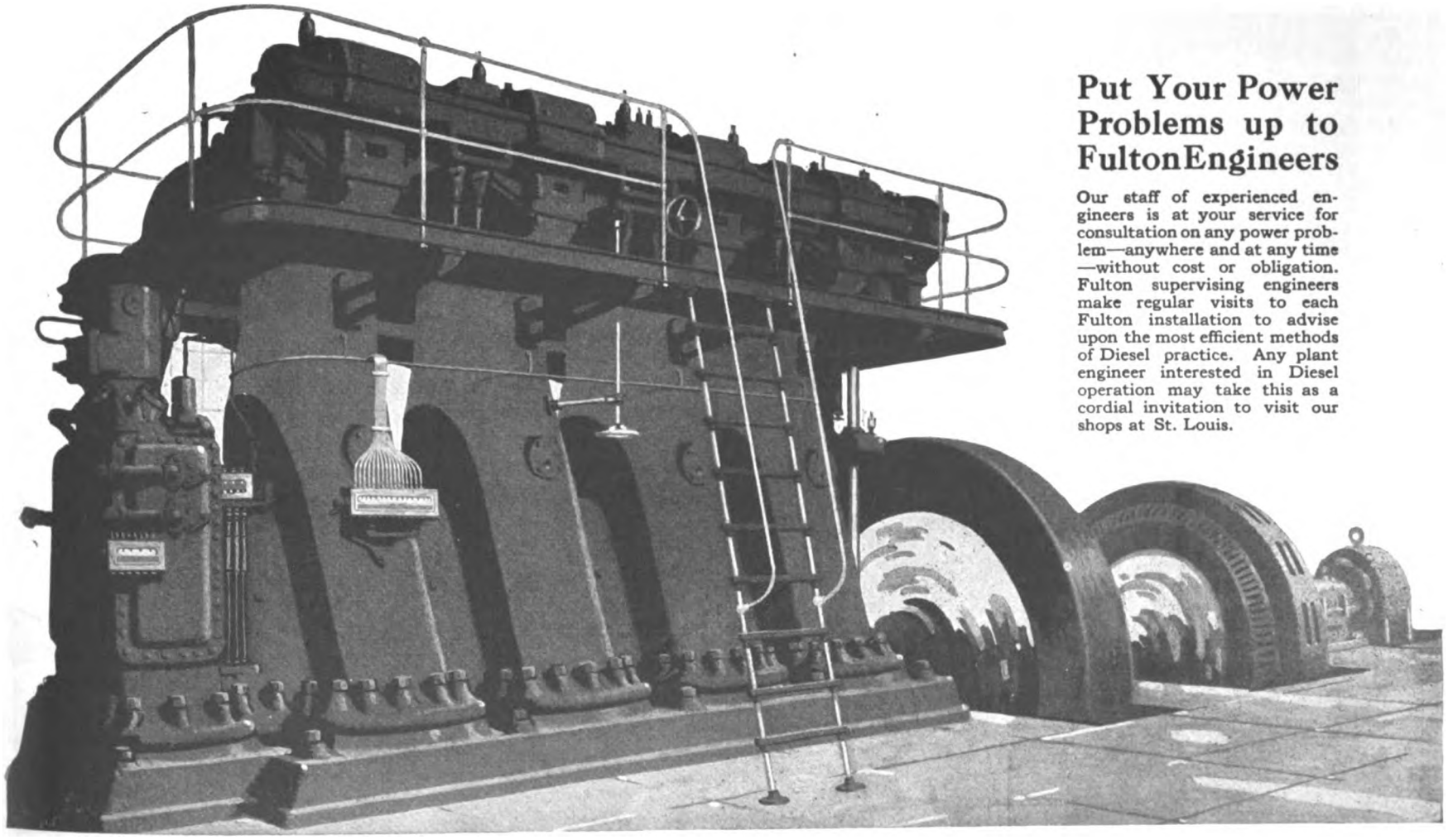
The Fulton-Diesel—American-built stationary engine—makes good on its mechanical merit, a development of 70 years' successful experience in engine building. It is a self-contained power plant, eliminating auxiliaries, feeding its own fuel, automatically controlled and having no waste to remove. One engineer runs it. It saves two-thirds the fuel required to produce equal power with steam.

Ask us to send you—free and postpaid—a copy of a carefully written and fully illustrated booklet, describing the Fulton-Diesel in detail.

Fulton Iron Works Company, St. Louis, U. S. A.

Successful Engine Builders for 70 years

Branch Offices: New York - 82 Wall St. Dallas, Texas - Praetorian Bldg. New Orleans - Hibernia Bank Bldg. Havana, Cuba - 401 - 402 - 403 Banco Nacional



Put Your Power Problems up to FultonEngineers

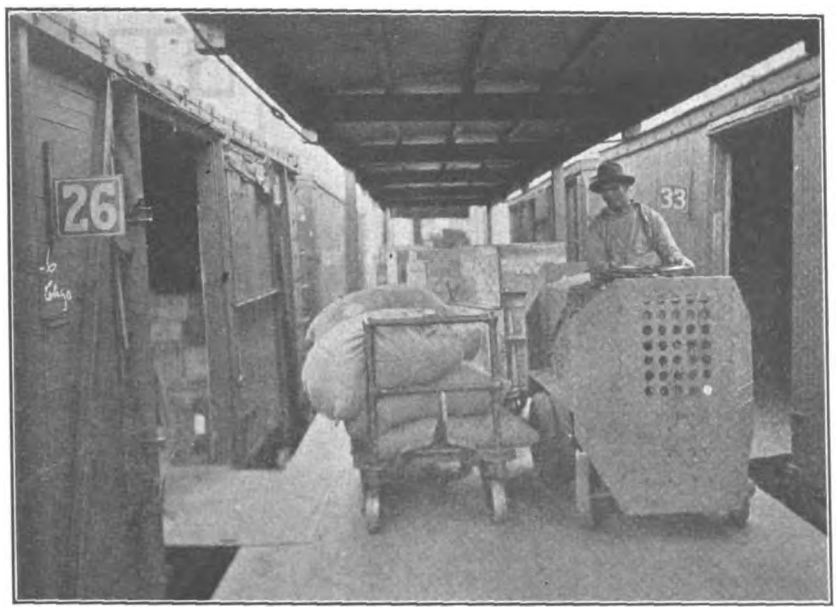
Our staff of experienced engineers is at your service for consultation on any power problem—anywhere and at any time—without cost or obligation. Fulton supervising engineers make regular visits to each Fulton installation to advise upon the most efficient methods of Diesel practice. Any plant engineer interested in Diesel operation may take this as a cordial invitation to visit our shops at St. Louis.

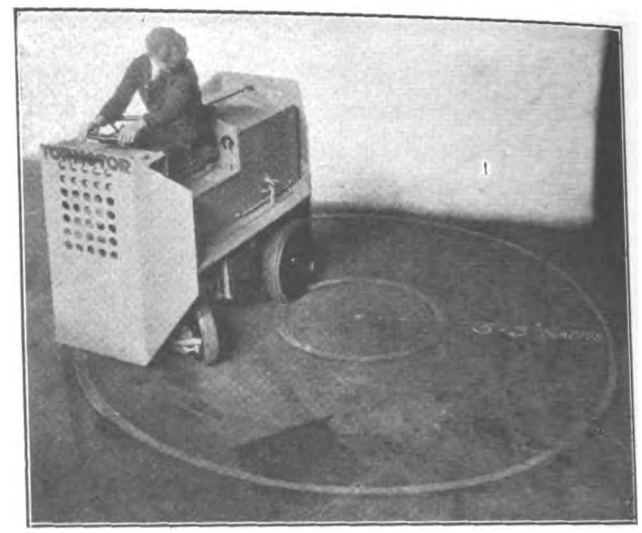
FULTON DIESEL

Digitized by Google

HERE IT IS!

Model C TOWMOTOR in action at the Lehigh Valley Terminal Pier No. 8, New York City







"Judging from the performance of this machine, I should say you have produced one that will fill a long felt want."

F. CLEARWATER, *Engineer.*

Chase Metal Works,
Waterbury, Conn.

THE TOWMOTOR COMPANY

1226 East 152nd Street — Cleveland, Ohio



THE TOWMOTOR

Digitized by Google

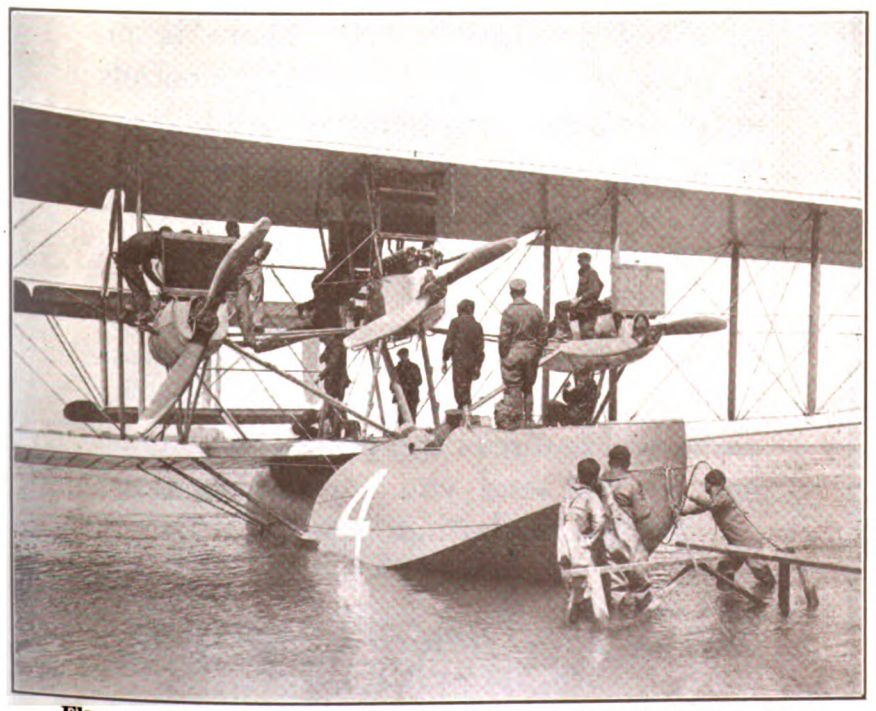
(*Continued from page 40*)

power plant of his balloon. That request was a turning-point. It definitely advanced the element in which Curtiss' speed complex functioned from the ground to the air, its planes of action from one to three.

Fellowship in aeronautical work with Baldwin, Selfridge, and Alexander Graham Bell led very soon to the formation of the Aerial Experiment Association. Each man in turn was to be the final authority in constructing an aeroplane, while all of them worked together on each machine. Curtiss' little factory at Hammondsport was the workshop. Their results at first were measured in inches. The first machine, on March 27, 1908, flew 318 feet, 11 inches. On May 22 the second did 1,017 feet in 19 seconds before it smashed. Curtiss' turn came third, and he called his machine "The June Bug," that being the month in which it was built. By this time the airplane had become a matter of sufficient promise so that *The Scientific American* had offered a trophy for a flight of one kilometer by a machine carrying a pilot who drove it under its own power. Curtiss felt enough confidence in his machine to enter it as a contestant, and on the Fourth of July "The June Bug" won the trophy. This was the first formal, announced flight to be made in the United States.

Progress was rapid during the ensuing twelve months, so the flight for the trophy in 1909 was extended to 25 kilometers. Curtiss again was the only entrant, but again his machine won the cup. He had so much margin that he kept on flying and covered nearly twice the required distance before alighting. That event was so reassuring that, at the last possible moment, he entered for the Gordon Bennett international races at Rheims, only five weeks later. His machine was actually not assembled until after it had reached France. Bleriot, in his monoplane, was expected to win, but instead Curtiss, in his American biplane, did it, August 29, 1909.

Another rush trip across the ocean, back to Hammondsport to prepare a machine for a record-breaking cross-country flight, from Albany to New York, for which the *New York World* had offered a prize of $10,000, as a feature of the Hudson-Fulton celebration. Here this article might profitably switch off to an essay on self-mastery, with Curtiss as its text. Two dirigible balloons tried the trip and failed. With the time limit shortening daily, with the celebration drawing to a close with the eyes of the world upon him, and especially those of the newspaper world, their pens growing daily sharper, Curtiss had every reason to make the attempt and have the thing over with. But this man of speed had, with it, control, self-control. At that stage of the flying art, atmospheric conditions had to be right, to assure safety and good results otherwise. And



Eleven years after "The June Bug" flew a mile with Curtiss alone, the N-C 4, weighing twelve tons, flew across the Atlantic in fifteen hours carrying six men.



Capital "Red Cap" Metal-Cased Factory and Mill Broom

CAPITAL

Industrial Brooms and Brushes



No. 60
Genuine African Bass Push Broom



No. 84 BB
Push Broom, Genuine Bass with Bamboo Center



No. 8
Bench Duster made of Tampico



No. 170
Floor Brush, Long Wearing Imported Fibre, Outside Gray Tampico

Cut Sweeping Costs

CAPITAL "Red Cap" metal-cased factory and mill brooms bring big savings in cleaning costs. Outlasts three or four ordinary brooms. Built in a wide metal case, nailed from each side with wrought-iron nails, reinforced with an extra metal band and two rows of waxed twine. Materials are selected broom corn and split bamboo mixed, all-corn, or corn and soft round rattan. Made for hardest service in factories, foundries, warehouses, iron, steel or textile mills, railroads, etc.

Brooms and Brushes for Every Industrial Use

CAPITAL Brooms and Brushes meet every industrial requirement in mill and factory brooms, push brooms, wire brushes, floor brushes, bench and counter dusters, electric and steam railway brooms, cannery brushes, etc. We have a dealer near you ready to supply your needs. Send the coupon for his name and for our illustrated Catalog 17.

Our Guarantee

If you are not satisfied with our brooms and brushes, you may return them at any time within 30 days and we will refund your money, paying freight charges both ways. Buy our products from your hardware or mill supply jobber under this guarantee. Make your own tests and comparisons. The results will speak for themselves.

MAIL THIS COUPON

Indianapolis Brush & Broom Mfg. Co.,
30 Brush Street, Indianapolis, Ind.

Send us Catalog 17, and the name of your nearest dealer:

Name.....

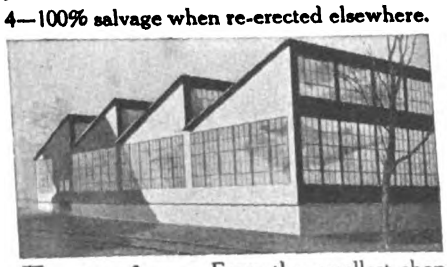
Address.....

Digitized by Google

TRUSCON
STANDARD BUILDINGS

Four Definite Savings

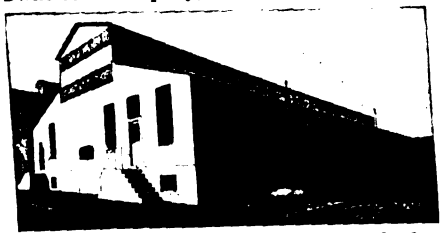
1—Cost less than other permanent buildings.
2—Quick erection insures earlier occupancy.
3—Small investment reduces carrying charges.
4—100% salvage when re-erected elsewhere.



Factories—From the smallest shop to the complete plant. Prominent users include: American Can Co., Baldwin Locomotive Co., Bayer Chemical Co., Postum Cereal Co., U. S. Aluminum Co.



Warehouses—Of size and arrangement to fit exactly all needs. Used by hundreds of leading companies including: Packard Motor Car Co., Swift and Company, Warner & Swasey Co.



Foundries—Well ventilated, fireproof and permanent. Users include: Allyne-Ryan Foundry Co., American Car and Foundry Co., Camden Forge Co., Dayton Malleable Iron Co.



Oil Buildings—Used for fireproof oil storage, filling stations, compressor houses, bulk stations etc., by such companies as: Atlantic Refining Co., Galena Signal Oil Co., Standard Oil Co.



Railroad Buildings—Used as shops, freight and express sheds, tool storage, bunk houses, waiting rooms, etc., by many railroads including: Chicago and Northwestern R. R., New York Central R. R., Pennsylvania R. R.,

Tell Us Your Problem

and we will quote you a price on a building erected, sure to meet your needs exactly—

Remember, the purchase price of these buildings consists only of our factory cost plus one overhead plus one profit. Write today.

TRUSCON STEEL CO.
YOUNGSTOWN, OHIO

Memo to write to Truscon Steel Co., Youngstown, Ohio, telling them our building problems

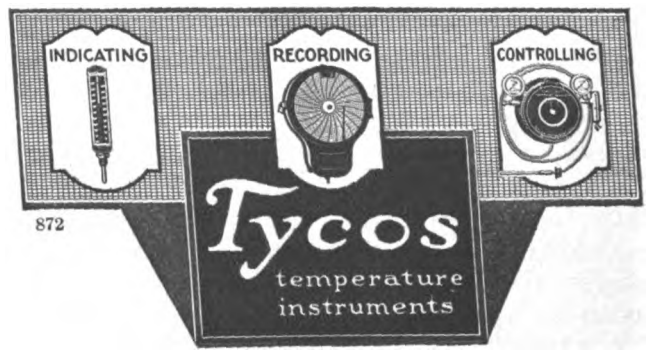
conditions were never right, in Curtiss' judgment, through so many weeks of waiting that the event had to be called off. The "wise ones" agreed that Curtiss had "pulled a good publicity stunt, anyhow." One of them would probably give any reasonable amount if he could recall the paper in which he remarked that "Curtiss gives us a pain in the neck."

For *The World* extended its offer a year, and on Sunday, May 31, 1910, the unperturbed and imperturbable Curtiss, having, with characteristic assurance, determined that conditions warranted making the attempt with fair expectations of success, made the attempt, and succeeded. He flew the 152 miles without mishap in 2 hours, 51 minutes, won *The World's* $10,000 cash prize, and became permanent owner of *The Scientific American* trophy.

That historic flight was made with a 25-horsepower, 8-cylinder motor. Step by step, refinement in 'plane and motor progressed until at Detroit, a few weeks ago, a specially built Army-Curtiss machine again carried its pilot faster than man had ever before moved through space. Its 400 horsepower motor, with twelve cylinders, delivers a horsepower for every 1¾ pounds of its weight. Such strides have been made in aeronautical science, and so deliberately are its principles worked out in Curtiss practice, that, before this machine was constructed, the tests of its small model registered an attainable speed of 219.8 miles per hour, while its actual official average speed in the race was 219.5! And it was built in less than ninety days.

Some early experiments showed Curtiss that rising from and alighting upon water presented a different set of problems from those met on land. For a few years he devoted his attention to the latter by developing the airplane. Then he set himself to working out the flying boat, a machine materially different from the airplane. Step by step the difficulties were ascertained, studied, solved—rising from the water, "landing" on it, flying from land to water, then from water to land, alighting alongside a warship and being hoisted upon it, flying from and landing on a warship's deck,

(*Continued on page 46*)



Tycos
Supremacy

over temperature problems that arise daily in industry is evident the world over. A list of *Tycos* users is one made up of the foremost manufacturers.

Tycos supremacy is backed up by

Tycos

Accuracy—Ruggedness—Dependability

Tycos accuracy is not delicate accuracy but rugged such as all instruments should be to withstand the strenuous industrial conditions of modern high speed production.

Tycos evenness of action in all temperature pressure controls and recorders gives them the dependability that accounts for so many satisfied users. There is no jumping or breaks when *Tycos* controls are on the job. Temperature can be controlled to within one degree and held there for the desired length of time. This smoothness of action is also one of the outstanding features of *Tycos* Recorders.

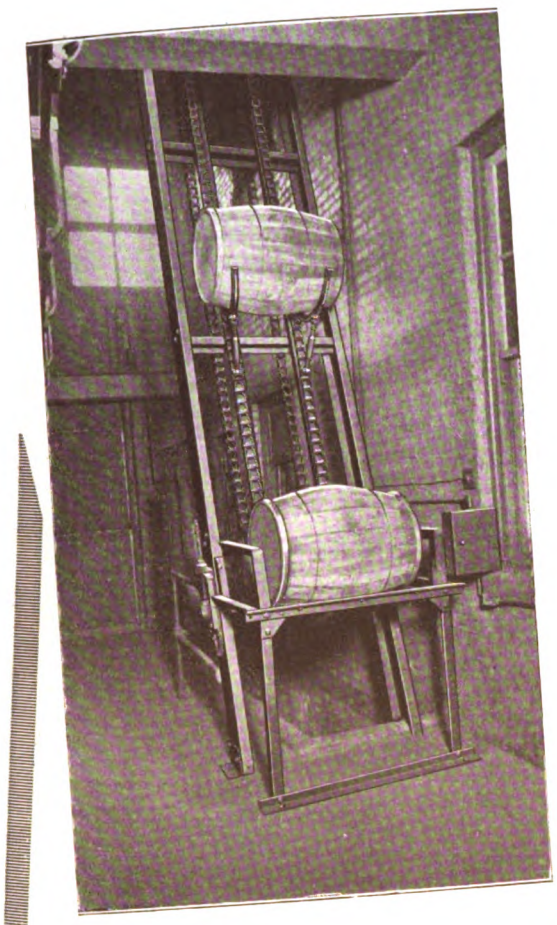
If you have to combat with or harness temperature in your plant send in the name and nature of the product you make and we will send you a reference book for your particular industry.

Taylor Instrument Companies
Rochester, N.Y. U.S.A.

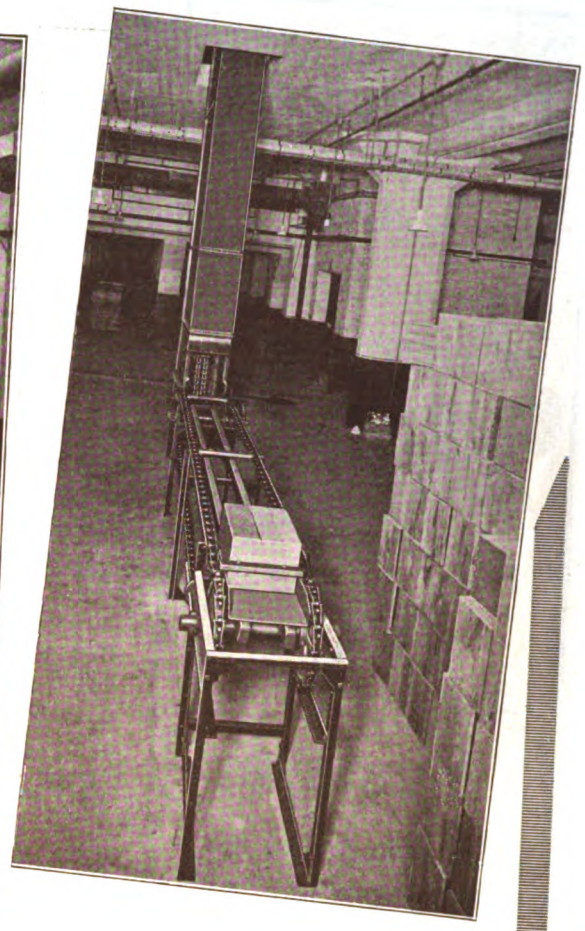
Theres a *Tycos* and *Taylor* temperature instrument for every purpose

387

Digitized by Google







Survey Your Plant Through The Eyes of Your Competitors.

SYSTEM immediately becomes the mooted question. True, productive machinery, such as machine shop equipment, mixers, looms, filling machines, etc., is practically standard. The equipment of this class that they have you have. But are you keeping your materials on the move so that all machines are producing constantly. That's the biggest factor of business today. And to keep products in the various stages of manufacture on the move you must use Conveying Systems.

Conveying Systems eliminate manual handling of materials, waste motion, keep operators supplied continuously with work, establish a working pace for employees thereby controlling production and carry finished product to stock room or shipping department. *Just what would a Conveying System mean to your business?* A greater productiou with present payroll which means increased sales and more profits.

Conveying systems to function properly must be designed to meet your requirements. To determine your needs an analysis must be made of your methods of manufacture which involves study of operations, routing of materials, determining maximum production and the securing of necessary data from which a Conveying System which will keep materials on the move in your plant can be designed.

We will gladly have one of our representatives call so that this matter can be discussed to your entire satisfaction.

SAMUEL OLSON & CO.

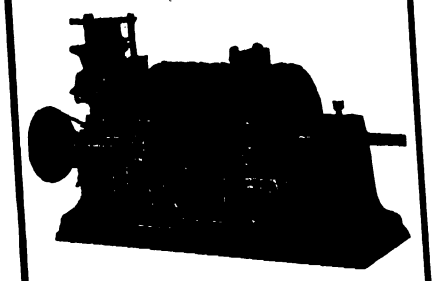
Loose, Bulk and Packed MATERIAL HANDLING SYSTEMS

2418-26 Bloomingdale Ave.
CHICAGO, ILLINOIS

5th Ave. Bldg.
NEW YORK, N. Y.

Digitized by Google

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway New York

(*Continued from Page 44*)

carrying a passenger—until every contingency had been met, and the United States Navy was satisfied, adopted the machine as a reliable arm of the service, and named it NC, meaning "Navy-Curtiss." The brilliant, epochal climax of this development came when, on May 17, 1919, the NC-1, 3 and 4 took to the air at Trepassey, Newfoundland, headed southeast for the Azores, across the Atlantic Ocean, and in 15 hours, 5 minutes, the NC-4 landed at its destination.

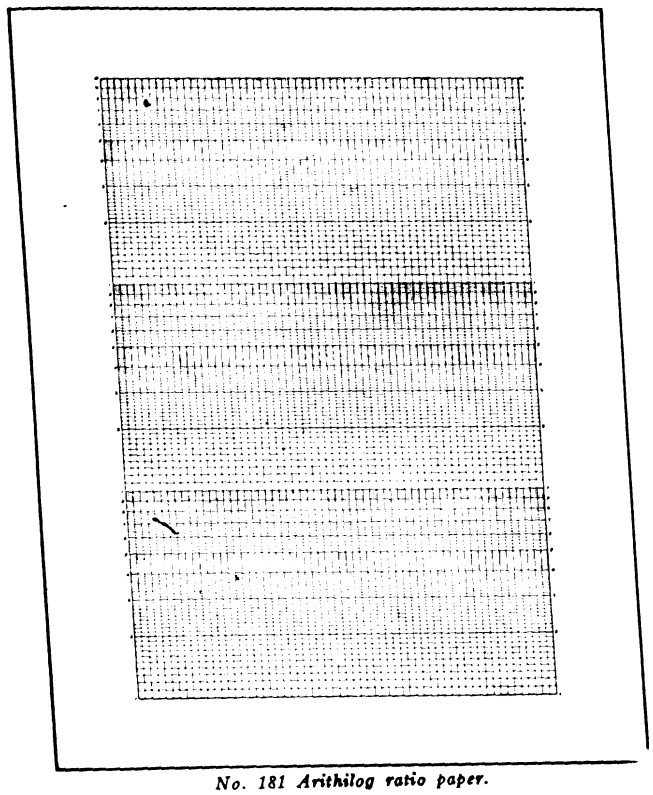
In the years between, Curtiss had introduced such innovations as dual control, so that two pilots could alternate in handling the machine; sending wireless messages to and from a flying 'plane, carrying the mails, and so on. Incidentally, Curtiss speed found a new vehicle in the shape of motor speed boats, and such winners as Miss Miami for example won with Curtiss motors. As early as 1911, without compensation, Curtiss began training Army and Navy officers in flying, at North Island, off San Diego, which is now one of the country's greatest training stations. When the United States entered the great war nine tenths of the pilots had been trained either personally by Curtiss, or in Curtiss machines. He does little flying now, mainly because in the great wind tunnel at the proving plant, by means of models, the conditions of actual flight are so perfectly reproduced that he arrives at the precise, first-hand experience which was the reason why he was his own pilot for so many years.

THE "Survey of Current Business," issued by the Department of Commerce states that price levels continued to increase in November, with both the total wholesale and the retail food indexes the highest since the end of 1921. The relative purchasing power of farm products was considerably improved in November, and this is reflected in the largest mail-order house sales since March, 1920.

The final crop reports for the year 1922 indicate a large production of the principal crops, especially wheat, potatoes and rye, and should make for increased prosperity in the farming sections.

EDEXCO CHARTING PAPERS

for putting BUSINESS RECORDS in GRAPHIC FORM



No. 181 Arithilog ratio paper.

1. They are printed on letter size paper, so that they are easy to file in letter files or bind up with typewritten reports.

2. Wide margins are left around engravings for insertion of scales, headings and notes. They are printed on white (on one side only) in a color of ink which reproduces readily.

3. They are printed on a paper which is strong enough to stand hard usage but which is unwatermarked and transparent so blueprints can be made.

4. Most EDEXCO sheets are specially divided for plotting business data by days, weeks, months and years and contain the right number of spaces for this purpose. EDEXCO curve cards also embody all these features.

TWO WEIGHTS

carried in stock for immediate delivery.

We also sell books telling how to use these papers. Our catalogue "H" describing these is free.

LABORATORY OUTFITS

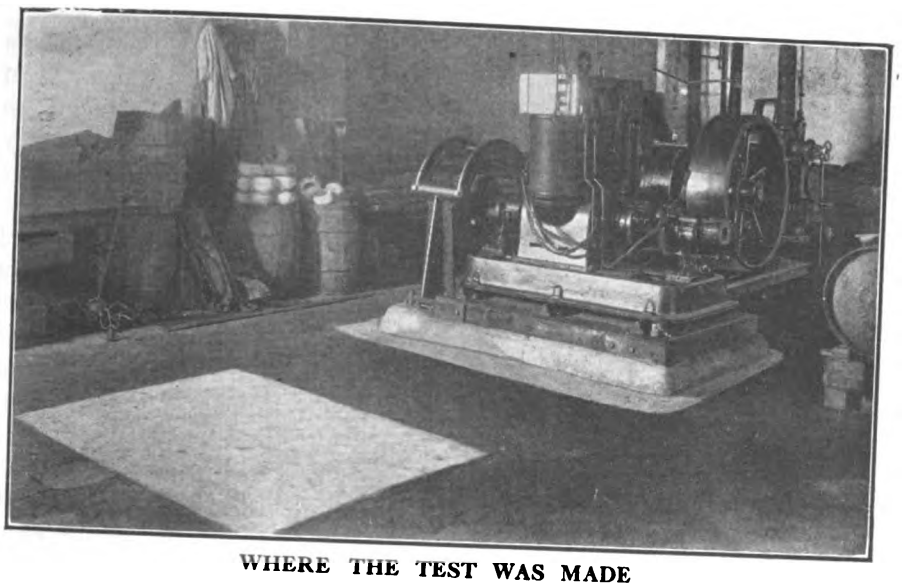
Containing instruction pamphlets and charting paper to experiment with:

OUTFIT No. 3, on General Business Charting. $2.00
OUTFIT No. 4, on Semi-Log or Ratio Papers. $2.00

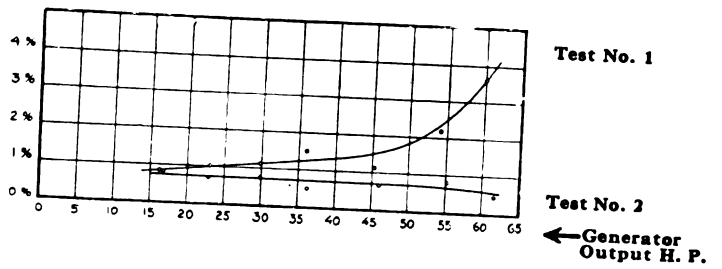
Shall we send you one or both?

Educational Exhibition Co. Graphics Headquarters
627 Custom House Street, Providence, R. I.

Digitized by Google



WHERE THE TEST WAS MADE



BELT SLIPPAGE IN %.

¶ Saving of belt slip 86% at 60 H. P. generator output OPEN DRIVE with canvas laggings on pulleys.

Belt Slippage Reduced 86%

Two tests were made on the generator drive shown above. The results are shown on the accompanying chart.

The No. 1 test was with an open drive with canvas laggings on pulleys. In test No. 2 the Lenix drive was employed.

The results may surprise those who are not familiar with the Lenix. It will be noted that as the H. P. advanced the Lenix not only prevented additional slippage but *actually reduced it.* At 60 H. P. the saving of belt slippage was 86%.

Yet this is only one of the savings effected by the Lenix. The "Five Points" at the left mention others.

If power or floor space mean anything to you—if a steady drive means anything—you will want to get the whole story about the Lenix. A post card will bring our booklet, "Saving Slippage and Space."

F. L. SMIDTH & COMPANY
ENGINEERS

50 Church Street, New York

Five Points

1—The Lenix increases the arc of contact between belt and pulley.

2—The Lenix maintains, constantly and accurately the proper tension in the slack side of the belt.

3—The Lenix saves floor space, building space and belting because of freedom in pulley locations.

4—The Lenix saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The Lenix permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

The LENIX Drive

Digitized by Google



FOR EVERY BUSINESS
OR
PROFESSIONAL MAN

The unit idea as first applied to filing cabinets by the Globe-Wernicke Company has made possible the standardization of office equipment for everyone.

Globe-Wernicke
FILING CABINETS

have fully demonstrated their superiority over a period of forty years. Each new unit when needed, blends perfectly with those already in use and with them becomes one piece of equipment. Made in wood or steel of the desired finish.

Agencies in all Cities. Send for FREE Catalog.

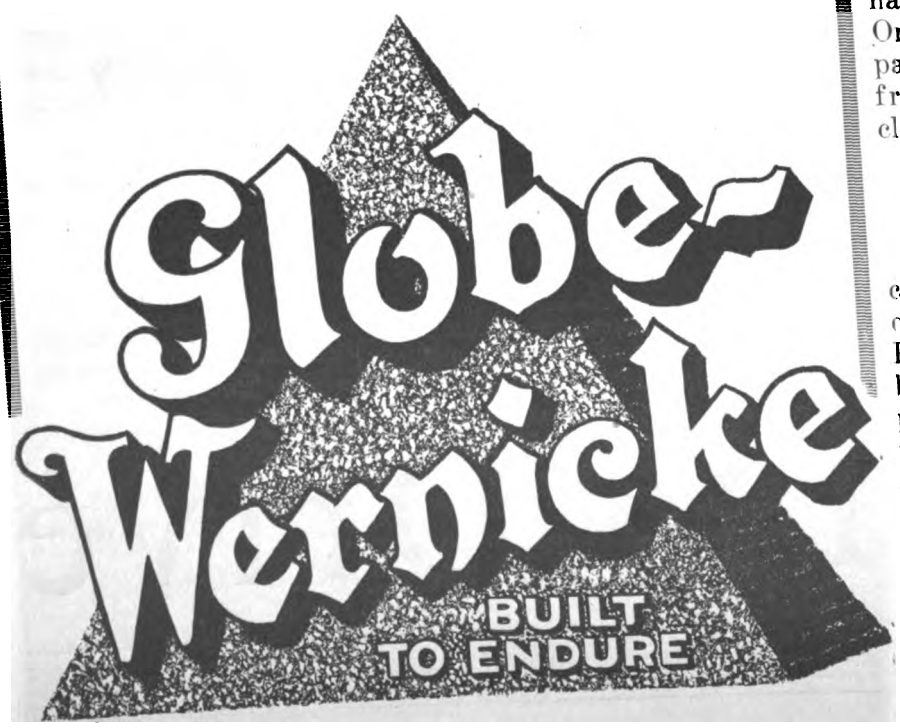
The Globe-Wernicke Co.

DEPT. II 81 CINCINNATI

Detroit
St. Louis
New York

Philadelphia
Chicago
Boston

Cleveland
Washington
New Orleans



The Use of Large Graphic Charts in Litigation

(*Continued from Page 17*)

When ready, these sheets were given to the writer who made a small sketch or layout of the chart on which was given the dimensions of the scale lines and other relevant information to be used by the draftsman who drew up the form of the chart. The data were then plotted and the plotted points were connected by the curve lines after they had been checked. The same scheme was followed in the making of the charts of the bar type which required painting. In this case the bars were drawn in in pencil and after being checked were marked with the color that was to be brushed in. When completed the charts were given serial numbers and a record was kept of them by means of a large score board fastened to the wall. The form of this score board is illustrated by Fig. 2.

PAINTING THE BAR CHARTS. Water color paint, known as show-card color was used in painting in the bars of these charts. Various colors were employed in ways to bring out the facts that were to be emphasized. The use of colors in this connecton is a study in itself. A great many of the charts were colored with but two different colors. Some of them, however, which showed a great many different factors were colored with as many tints.

The show-card color when properly applied makes a fine appearance which greatly enhances the value of the charts. One handy feature of this paint is that it can be removed from the drawing paper with clear water and a brush.

DRAWING IN THE CURVES OF THE LINE CHARTS

In the case of line charts the curves were made about one-quarter of an inch in width. Practically all were drawn with black india ink. The Stoakes pen was used for this work and proved to be a great time-saver as the lines could be drawn with one stroke of the pen.

LETTERING THE CHARTS

The scales, notes and titles of the charts, in fact all the lettering was done by gummed figures and letters. These letters were of various sizes from about ½ inch to 3 inches in height. As time-savers they could hardly be beaten. They were made of paper in black, red and white. Interesting and effective combinations were made possible by the use of the colored letters. The success of the charts was largely dependent on the use of these gummed letters. They were quickly and easily applied and made a job that could hardly be equaled by painstaking hand work with ink.

The letters were kept in alphabetical order in small boxes glued on a piece of cardboard. The photograph, Fig. 3, shows one of the chart men using this arrangement in lettering the chart. Their clear-cut appearance is plainly brought out by the charts shown in the background of the picture.

PHOTOGRAPING THE COMPLETED CHARTS

Fig. 4 is a photograph of the rack used for holding the charts while they were photographed. As fast as the charts were completed, they were set up on this frame and photographed. 8 by 10-inch prints were used by counsel for study and during the trial similar prints were handed to the members of the jury for their inspection.

FILING THE COMPLETED CHARTS.

Fig. 5 shows one corner of the chart room and the racks in which the completed charts were filed. They were arranged by number so that they could quickly be pulled out for inspection. Those used in the trial were carried in these racks to the court, and this scheme provided a means of quickly displaying the charts on the easel of the court room during the progress of the trial.

USE OF THE CHARTS IN CONFERENCE.

Graphic Charts have the reputation of "showing at a glance" a great mass of tabular data. This feature was admirably brought out in the conferences preceding the trial. The charts on the various

(*Continued on Page 50*)

Digitized by Google



You would not allow your salesmen to guess at their expense accounts.

Yet you may be guessing at production costs.

If one of your salesmen sent in an expense account reading like this, "R. R. fare from New York to Albany about $10.00, hotel bill for two days about $30.00, meals about $20.00, total about $60.00," there would be trouble immediately.

Yet you may be keeping your production costs in the same inaccurate way. When an operator keeps his own time records by the old pencil and paper system he is never exact. He guesses that the job took about so many hours or minutes and puts down his guess as a part of your time records.

There is no excuse for such antiquated methods today.

A calculagraph will record mechanically the elapsed time for any number of operators. It is a spring-driven, self contained instrument, with none of the mechanical disorders so often found in electrical time recorders. It prints right on the job ticket the starting, stopping and elapsed time of each job. It assures accurate records, saves the time and eliminates the mistakes of timekeepers.

Wherever elapsed time is a factor—in large factory or small shop—the Calculagraph quickly pays for itself as a saver of time and money.

If you have never seen our booklet, "Elapsed Time Records," write for it today.

THE

CALCULAGRAPH

THE ELAPSED TIME RECORDER

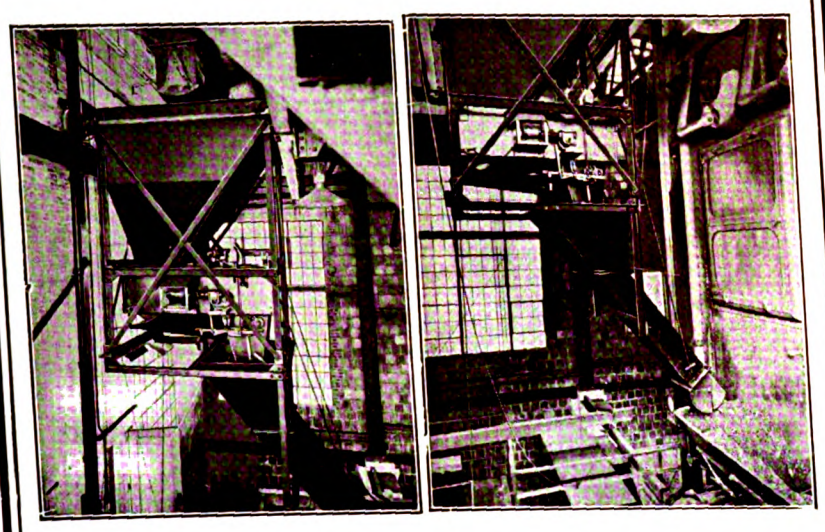
34 Church Street, New York City

Digitized by Google

If Your Boiler is Using an Extravagant Amount of Coal,

Get After It.

Harness Your Power



Use the RICHARDSON Automatic Coal Scale

To Check the Consumption of Each Individual Boiler in Your Plant

You'll Get Better Efficiency and Save Money on Your Coal Bills

Accurate, continuous records of consumption automatically registered by the machine. Scale weighs any kind of coal successfully. Wet or frozen lumps won't phaze it. Absolutely sulphur proof and rust proof.

Faulty draft regulation, improper firing, soot, scale, holes in the fire, all tend to lower the efficiency of a boiler. A RICHARDSON will locate the trouble and you can correct it.

Supplied in the following standard sizes.

200 lb. size,	1	ton hopper, capacity	6 tons per hour
300 lb. size,	1½	ton hopper, capacity	9 tons per hour
400 lb. size,	2	ton hopper, capacity	12 tons per hour
500 lb. size,	3	ton hopper, capacity	20 tons per hour
1000 lb. size,	5	ton hopper, capacity	40 tons per hour

RICHARDSON SCALE COMPANY

Passaic, New Jersey

New York Boston Buffalo Chicago Minneapolis
Omaha Wichita San Francisco Memphis Atlanta

(*Continued from Page 48*)

phases of the defence were exhibited to the counsel and their decisions were made with great expediency as to the proper chart to show the desired fact. It was possible to make quick comparisons of the business of the cement companies with general business by the use of these charts. They clearly and quickly showed the facts that hours of study would have but half brought out had only the figures been used.

USE OF CHARTS AT THE TRIAL.

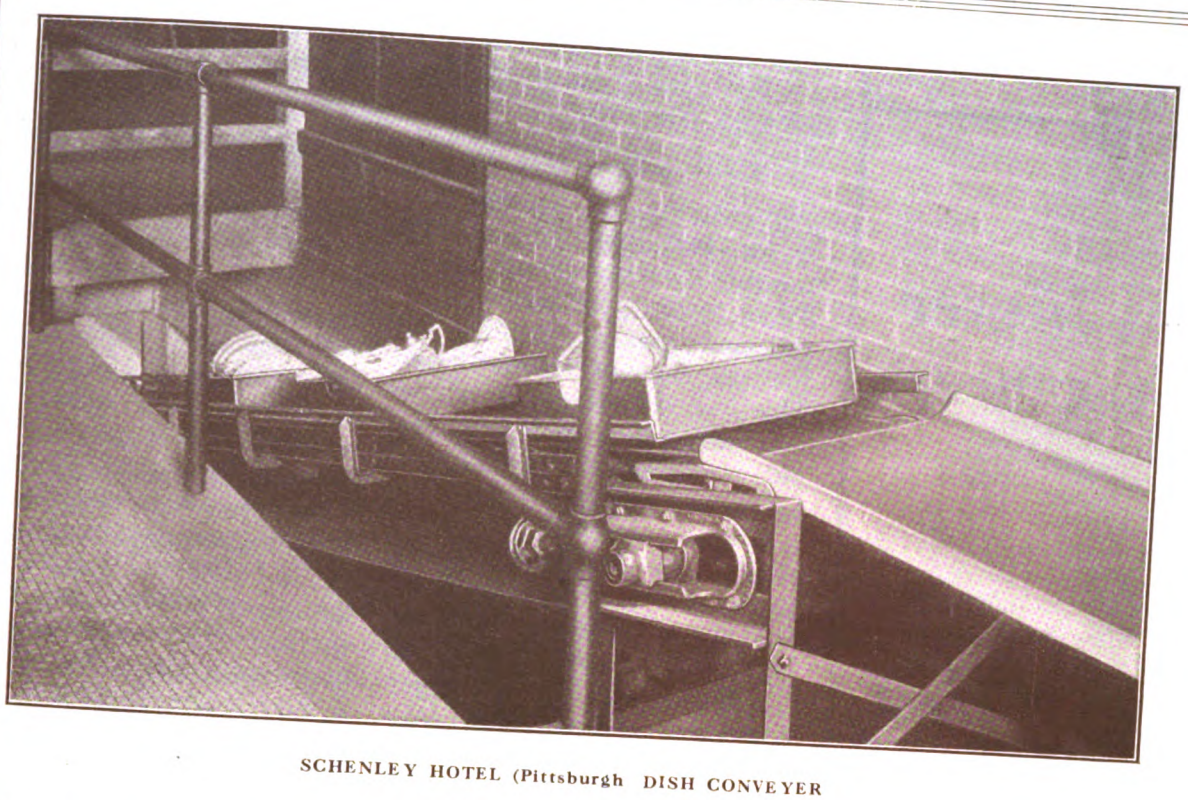
It was interestng to note the effect on the court and jury by the display of the charts during the trial. As the charts were displayed on the easel they received the most earnest attention. The charts made an excellent impression and were particularly successful in relieving the seemingly dry discussions by giving the court, jury, counsel and spectators "something to look at."

ABOUT half the freight loaded on our railroads, according to an estimate made by a well-informed man experienced in both mining and transportation, is contributed by our coal mines. This portion includes coal loaded at the mines and coke loaded at the ovens, both consigned to consumers all over the country, and coal loaded for the railroads themselves, as well as articles of mine equipment and supply loaded at industrial centers more or less distant from the coal mines. Even though this figure may later be shown, on fuller presentation of the facts, to be somewhat high, the big outstanding truth is that the coal mines and the railroads are co-partners on a large scale in the business of the country. This co-partnership, based on mutual interest, —the railroads being the largest purchaser of coal and the mines being the largest customer of the railroads—gave special significance to a conference held recently between a representative committee of the American Railway Association and the United States Coal Commission.

The railroad men present at that conference showed their desire to coöperate in the work of fact-finding by suggesting subjects on which they could contribute statistical facts. The perennial topic of car shortage is only the introduction to the larger questions—what investment in railroad equipment is justified to meet the demands of an overdeveloped mining industry? What can the public afford to pay to accommodate its own seasonal demand for coal? The operating officials of the railroads can also point to the effects of seasonal movement of coal and other commodities on the cost of operation of their roads.

The coal operators are themselves not unmindful of the peak demand for transportation arising in part from the seasonal demand for coal. One large mining corporation in the Middle West has several times made its annual appeal to its customers for early purchase of coal in the form of a full page reproduction of a photograph of two huge locomotives snow-bound on the track, with the simple legend "Lest you forget 1917-18." Such a remainder is pertinent every year, for the greater part of the American public either forgets or has never learned the obvious connection between snow-clogged freight yards and delayed coal at the very time when coal is most needed. How much of this seasonal burden on the railroads can economically be avoided is one of the questions the American Railway Association can help President Harding's Coal Commission to answer. Possibly the consuming public can itself also help in lowering the cost both of hauling coal and of mining it.

Digitized by Google



SCHENLEY HOTEL (Pittsburgh DISH CONVEYER

A Conveyer That Has Not Broken A Dish in Two Years of Constant Operation

To save the heavy expense of constantly replacing broken dishes the Schenley Hotel of Pittsburgh installed a Mathews Conveyer to handle filled trays between dining room floor and dishwashing room on floor below. The illustration above shows receiving end of a belt conveyer on which the trays gently travel on a moderate incline to the lower floor. The illustration below shows how the trays come off the belt conveyer onto a gravity roller conveyer, consisting of a short straight section and curve.

Aside from handling the dishes faster and cheaper from a labor stand point, the system has already paid for itself in saving broken dishes alone.

Mathews Equipment For Most Any Conveying Problem

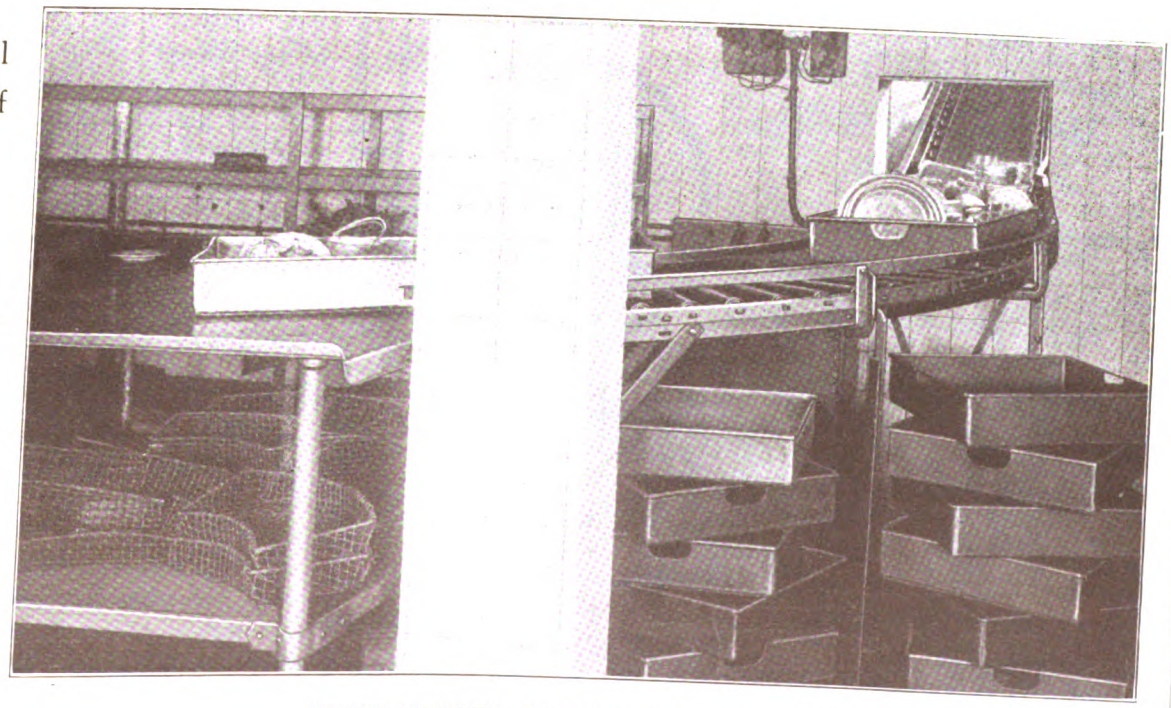
For speeding up interdepartment transportation, saving labor, saving floor space, increasing production and promoting general plant efficiency, the answer is a Mathews Conveying system. Whether its an small, portable gravity conveyer line for the shipping room or a complete system tying together all the departments of a mammoth factory, we are prepared to furnish it. Our nearest engineer will make a thorough survey and analysis of your problems without cost or obligation.

Send for your Copy of our General Catalog, and give us a ountline of your problem.

MATHEWS GRAVITY CARRIER COMPANY

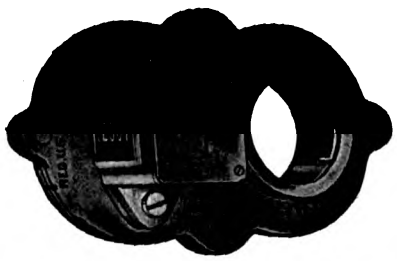
157 Tenth St., Ellwood City, Pa.

Branch Factories:
PORT HOPE, ONT.
LONDON, ENG.



SCHENLEY HOTEL (Pittsburgh) DISH CONVEYER

Digitized by Google



The "C. J." Coal Meter
Stops Coal Extravagance

THERE is only one way to stop coal waste and that is by knowing the amount each boiler is using.

The "C. J." Coal Meter accurately measures the number of strokes made by the underfeed stokers. This number, multiplied by an easily determined constant, gives the total number of pounds of coal used.

No extra effort—the cost is insignificant—absolutely no expense for operation. The "C. J." Coal Meter helps determine the proportion of the load each boiler carries. It aids in detecting any faults in the boiler and irregularities in operation which lead to fuel waste.

Adapted to Jones, Taylor, Westinghouse, Sanford Riley and Detroit Stokers. Sent on 30 days' trial.

Write for Illustrated Literature

C. J. MFG. COMPANY
COAL METER
3401 N. 5th Street Philadelphia, Pa.

EFFICIENT HEATING

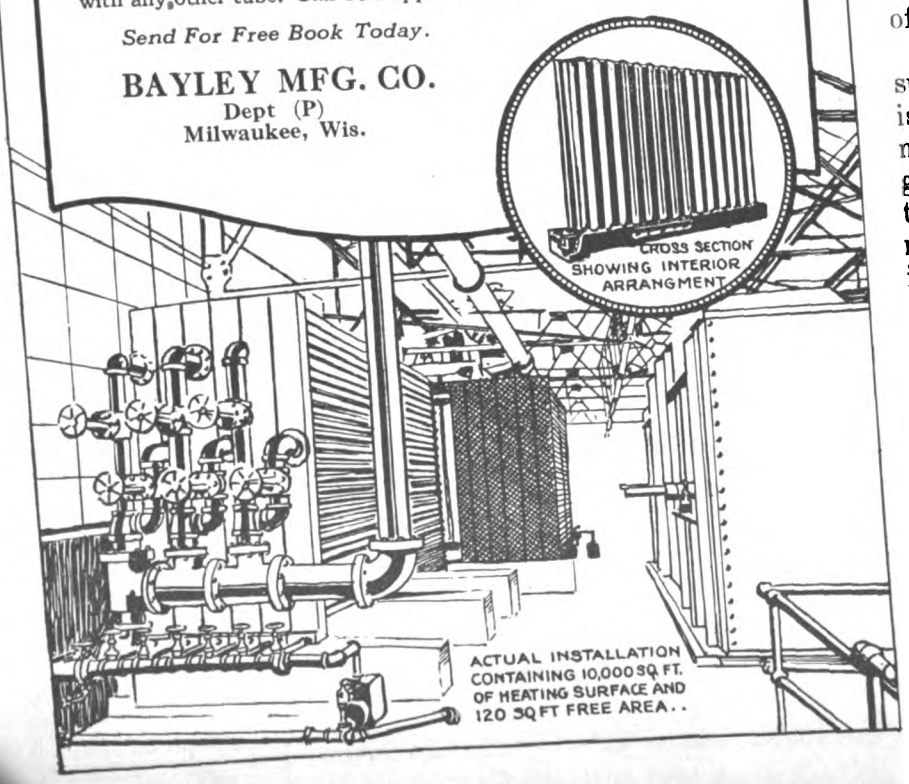
Demands Radiators so constructed that every square foot is prime heating surface.

Bayley CHINOOK HEATERS

are built on the "tube-Within-A-Tube" principle, every tube a complete radiator in itself, free from water hammer, return bends, elbows and nipples. Any tube can be removed without interfering with any other tube. Can be shipped K. D.

Send For Free Book Today.

BAYLEY MFG. CO.
Dept (P)
Milwaukee, Wis.



The Modern Version of An Old Art

(*Continued from Page 23*)

photogravure. Its marvel lies in the fact that, with all its rapidity, and its change from flat to rotary printing, none of the perfection of the original process has been sacrificed. This is due to the microscopic accuracy maintained throughout the several steps of the operations.

Immense cameras are used, which take the double-spread pages of a newspaper in their full size. In the preliminary steps, type and pictures are handled separately, and then assembled toward the last. The pages of type are set up and photographed. In the case of picture pages, the borders are hand-drawn and the titles are set in type, making a skeleton lay-out, lacking the pictures. All this is photographed on wet film, and a film positive is taken. Pictures are copied separately on dry plates, any necessary reductions or enlargements being made. These picture negatives, carefully trimmed to the size and shape of their alloted spaces on the finished page, are laid down on a full size dry plate in the exact positions in which they are to appear, and printed thereon as positives. On this large positive plate the film positive previously mentioned is now laid down with the borders and titles in their proper positions with reference to the illustrations, so that this plate now presents the appearance of the actual newspaper page.

In the next step "carbon tissue" is used. Although there is no carbon in it, the trade name clings to this transparent gelatine film. Its surface, naturally somewhat rough, is made dead smooth by softening it and then drying it on finely japanned tin sheets. It is sensitized to light with bichromate of potash. Next the walls of the ink cells are provided for by screening the carbon tissue. It is laid on a sheet of glass scored both ways with lines, 150 to the inch. That is so fine that the lines are invisible to the naked eye, and they actually break up the light waves so that the surface is iridescent. These lines are impressed upon the carbon tissue by suction under a powerful vacuum.

Now the positive photographic print is printed upon the sensitized, screened carbon tissue. In the next step the copper printing roll comes into play. This is a beautifully fine piece of work in itself. The foundation is a cast steel cylinder eight to twelve inches in diameter. It is electro-plated with copper to a thickness of about 1/16". This has a glistening, crystalline, finely rough surface which must be made so microscopically true that a knife-blade, called the doctor-blade, as long as itself, will have such perfect contact with all points on its surface as it revolves that the blade will shave off every particle of ink and leave the surface absolutely clean. This trueing is accomplished in a lathe with rotary motions in three dimensions. The cylinder rotates in the lathe on its own axis. A polishing stone rests upon it and is carried back and forth along its length by means of a longitudinal rack. By means of a circular rack the stone is given an eccentric rotary motion in the plane of its own surface, like that of the hand in polishing a window, for example. And again, the stone rotates on its own center at the same time. The stone itself is interesting. The needed fineness and uniformity of texture are found only in a whetstone known appropriately as Tam O'Shanter since it comes from the Highlands of Scotland. It is entirely free from iron or other impurities which might make even a microscopic scratch.

Now on the beautifully polished, gleaming surface of the copper cylinder the carbon tissue is rolled, and its paper back is washed off with water. All parts of the page which are to be blank, and therefore must not be etched, are now painted out on the carbon tissue with asphaltum. Acids, applied with extreme care by expert workmen, etch through the carbon print into the copper, the depth of the etching being governed by the varying degrees of chemical change in the tissue effected by the light and dark

Digitized by Google

portions of the photographs upon it, which in turn affect its resistance to the action of the acids.

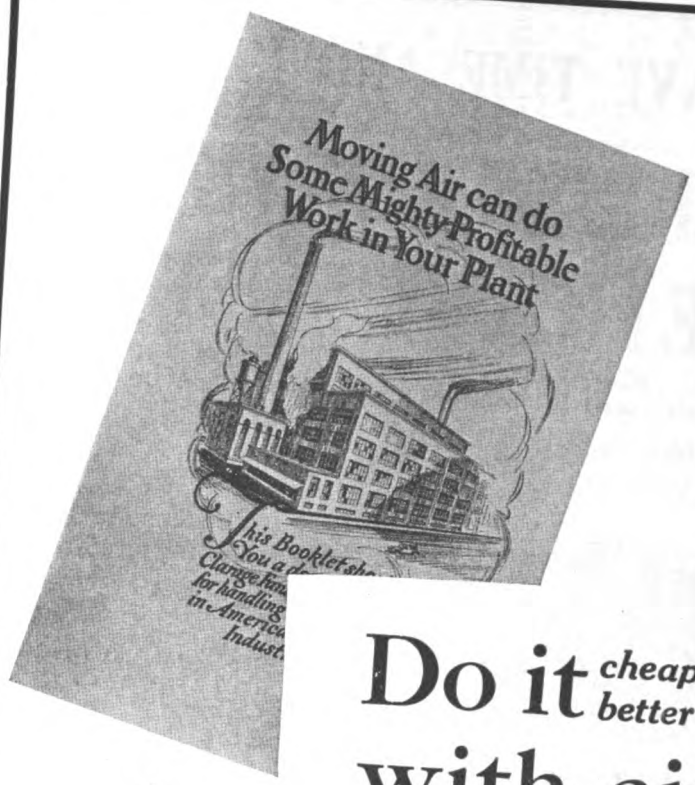
The etching, as has been said, varies in depth from .004″ to .009″. This variation may seem so trifling as to be of no great value, but as a matter of fact it is exactly what gives photogravure and rotogravure their advantage over half-tone engravings. A half-tone is given a film of ink which can never vary in its thickness, and its effects of light and shade must be produced entirely by enlarging or reducing the individual dots which make up its surface, so that it cannot present to the eye the solid, or full-tone, effects of the original picture from which it was made. To make sure that the dots of ink do not run together and produce smeared effects the half-tone (unless it is made very coarse, as in newspaper cuts) must be printed on a very high-finished, glossy paper.

Rotogravure, on the contrary, employs soft-finished paper, for two advantageous reasons. The texture, without gloss, is more pleasing to the eye, and imparts a softness to the picture itself; and, in the darker portions of the picture, in solid lines and letters, where the cell partitions are exceedingly thin, the ink tends to run together before drying, thus enhancing the full-tone effects. The use of high-finish paper is not precluded, and sometimes is preferred.

Placed in a rotary web press, the finished cylinder prints from 3,000 to 10,000 impressions an hour. The great bulk of "roto" printing is done for the Sunday newspapers, of course, a few having their own plants. Most of it is done on contract by a few large job printing plants, for the newspapers and magazines. But more and more is the process being used for other than periodical publication. Catalogues, booklets, leaflets, even single-page pictures, are printed by grouping a number of jobs together on the printing cylinder so there will be no waste space on the paper. With such work, if it is desired to have the unit cost low, the quantities must be fairly large. It will be apparent from the foregoing description that in rotogravure the preparation cost, with the several processes and meticulous care involved, must be high as compared with older processes, while the printing cost on quantity runs on web presses, is exceedingly low.

DECLARING that there is no such thing as a spontaneous explosion, David J. Price, engineer in charge of development work of the Bureau of Chemistry of the United States Department of Agriculture, in an address before the Safety Bureau of the Chamber of Commerce today, called attention to the danger of dust explosions in various kinds of industrial plants and discussed the methods of prevention that have proved effective.

In 13 recent dust explosions in representative types of manufacturing plants, said Mr. Price, 155 lives have been lost and property and foodstuffs to a value of more than $16,250,000 destroyed. Although the first disasters of the kind on record occurred in flour mills, operators of these plants have done more, perhaps, than almost any others to eliminate the danger and control this hazard. At the present time the explosions are being reported in industries that a short time ago were thought to be safe from any such danger. Large losses of life and property have resulted from the ignition of dust in grain elevators, feed mills, sugar refineries, and starch factories. There have been explosions of dust from powdered milk, aluminum, magnesium, rubber, cork, cocoa, spice, lime-sulpher insecticide, bark, soap, and fertilizer. In a total of 110 disasters of the sort the money loss has been approximately $30,000,000, an average of more than $270,000 for each accident. This does not include the losses in connection with threshing machine explosions and cotton-gin fires.



Do it *cheaper better* with air!

HAVE you studied the dollar-saving possibilities of moving air? The savings, whether direct or indirect, easily pay the cost of the system.

Fans, blowers, and exhausters are increasing the efficiency of employees by supplying an abundance of clean, fresh air to every part of factories and shops. And in doing this they are cutting the cost of factory heating.

Applied to pneumatic conveying systems, blowers and exhausters are cutting the cost of handling material in work; applied to exhausting systems they are bettering working conditions by eliminating dust, dirt, and fumes; applied to boiler furnaces they are increasing combustion efficiency, and in foundries and gas plants they are speeding production.

The wide utility of fans and blowers—only hinted at above—is explained in this brief but thorough booklet. Don't say you know the possibilities of moving air until you read it.

This FREE Booklet

shows how moving air is bettering conditions and cutting costs in plants of all types.

Clarage Fan Co.
KALAMAZOO, MICH.

Branch offices in principal cities

MAIL THIS COUPON FOR FREE COPY
Ind. Ill. 1-23
Clarage Fan Co., Kalamazoo, Mich.
Send a copy of your booklet explaining the possibilities of moving air.
Company .....
Address .....
Your Name .....

Digitized by Google

SAVE TIME AND LABOR

Use The

MERRICK CONVEYOR WEIGHTOMETER

Any material which is conveyor handled can be weighed without additional handling or loss of time by the Merrick Weightometer.

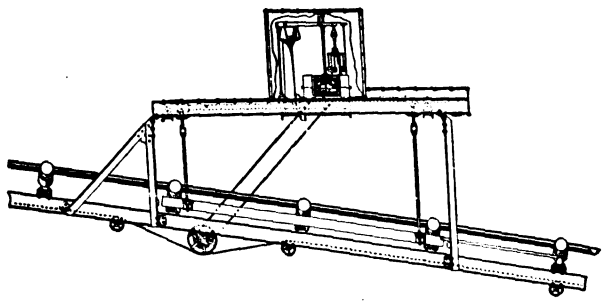


TYPICAL INSTALLATION MERRICK WEIGHTOMETER

Hundreds in use weighing all classes of materials such as

coal, run o'mine and crushed.
Coke
Stone, coarse and fine.
Gravel.
Sand.
Cement Rock.
Cement Clinker.
Metallic Ore.
Phosphate Rock.
Phosphate Pebbles.
Wood Chips.
Sulphite Pulp slabs.
Fish and Fish Products
Finished Cement
Zinc Ore,
Iron Ore.
Copper Ore.
Lead Ore.
Gold Ore.
Silver Ore.

NO WEIGHMAN OR ATTENDANT REQUIRED
GUARANTEED AND PROVEN
99% ACCURATE



Method of Installation

Why rely on Bill of Lading Weights?
Why not be able to tell exactly how much material you receive?
Hundreds of concerns buy and sell their products using Merrick Weightometer weights.

For Information Write

MERRICK SCALE MFG. CO.,

180 Autumn Street — PASSAIC, N. J.

(*Continued from Page 53*)

Mr. Price emphasized the necessity for adopting the safety devices and practices recommended by the department. One of the most necessary factors is the coöperation of workmen with the officials of the companies in applying methods and refraining from dangerous practices such as smoking and using open lights.

THE fact that hollow spheres can be used for measuring the total light given by a lamp has been known for some time, but recently their use has increased very greatly because the new gas-filled lamps which have an irregular shaped coil filament can not be very well measured with any other apparatus. Consequently, every factory and laboratory which wishes to make accurate measurements of such lamps has to have a sphere.

The Bureau of Standards at Washington has, therefore, issued Scientific Paper No. 447, describing a large sphere built at that Bureau and giving a complete explanation of the theory of spheres as light measurers and of the precautions which must be taken in order not to make mistakes when using them. The particular sphere described is 88 inches in diameter and weighs about a ton, but for different purposes spheres from 3 inches to 10 feet in diameter have been used. Some of these, for example, are made as attachments for pocket-size "Illuminometers" and are carried about to measure the reflections from walls and ceilings and from samples of paper, paint, and other materials, while modified forms on a large scale have been used to catch the beams from full-sized army searchlights and measure the light in them.

If we wish to know the total amount of light given off by a lamp, we must not be content with measuring the candlepower in one direction only. We must measure it all about the lamp in many directions and take an average of the results. Actually to measure lamps in many different directions would require an enormous amount of time and work, and several ingenious devices

(*Continued on Page 56*)

Show the Workman He's "Getting On"

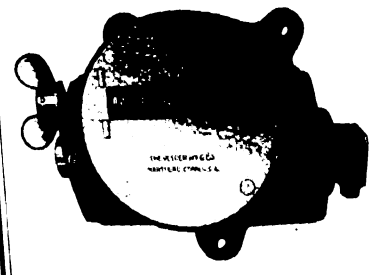
There's one way of counting production, which gives you more than a mere count. It gives you more keen, competent workmen; more "pep" in attending machines.

A Veeder Counter on a machine shows the operator how he's *getting on*, both with respect to his hourly production and his daily gains in efficiency.

It gets men *away* from a machine-like grind; gets them "into the game"; gets them forging ahead! —when their work **scores** on a

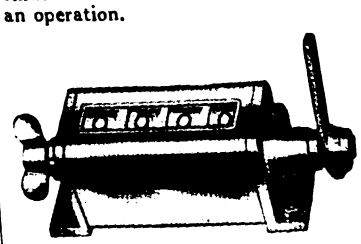
Veeder COUNTER

Here's a big new development in a Punch Press Counter; a heavy-cased ratchet mechanism, immensely durable:



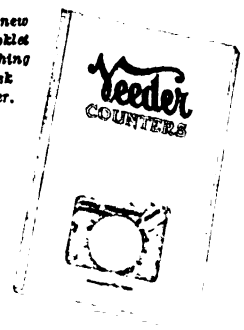
Built especially for recording the product of punch presses, metal stamping machines and other heavy-duty machinery. Strong stops limit the movement of the lever to 45 degrees or ⅛ turn, which registers one on the dial. The large, legible figures are easily read ten feet away. Counter is regularly furnished with five figure-wheels, and may be set back to zero by one turn of knob. Requires no special fixtures for attaching. Price, $18.00.

The Revolution Set-Back Counter below records the output of any machine where a shaft-revolution indicates an operation.



Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figure-wheels, as illustrated, $10.00—subject to discount. *Cut less than one-half size.* Set-Back Rotary Ratchet Counter, to record reciprocating movements as on punch presses, $11.50 (list)

FREE—This new 80-page booklet shows everything you could ask in a counter. Ask for IT.



The Veeder Mfg. Co.

63 Sargeant St., Hartford, Conn.

Digitized by Google



A Tower of Strength

The highest grade of materials and workmanship and correct, scientific design have made the Caldwell Tubular Tower a veritable tower of strength.

Its construction is so simple you can erect it yourself. Because of low wind resistance and sturdiness of material used it will safely weather the most severe storms. Appearance, trim and pleasing. Cost, moderate.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook St., Louisville, Ky.

COST Accounting

Only School in U. S. Specializing in Cost



"Opportunity" knocks but once.

So don't let this opportunity pass to investigate the J. Lee Nicholson Institute of Cost Accounting, the best school of its kind in existence.

Nicholson trained cost accountants are big valuable men of large incomes. They fill big positions because they know exactly what to do and how to do it. And here is a profession where the demand is greater than the supply.

Consultation Free

Send for Booklet

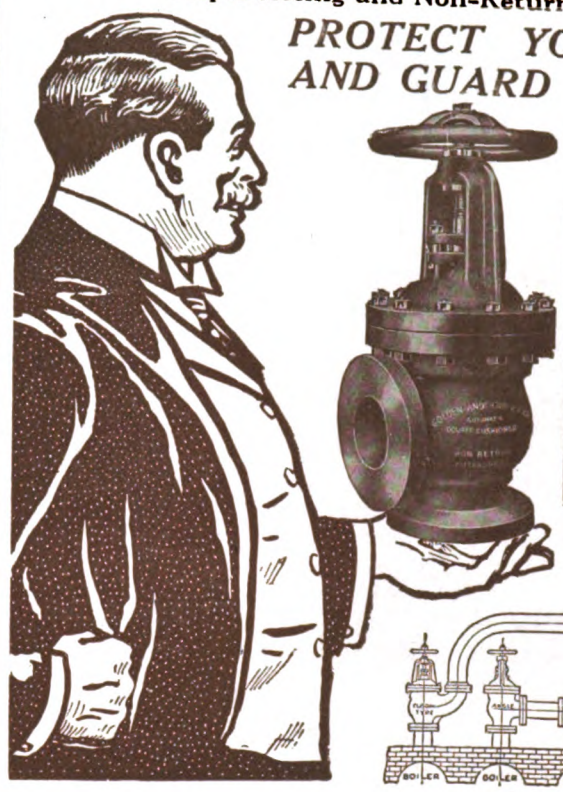
J. Lee Nicholson Institute
Dept. G
6 North Michigan Ave., Chicago, Illinois.

GOLDEN-ANDERSON

"Life and Property Insurance Valves"

Patent Automatic Double-Cushioned Triple-Acting and Non-Return Valves

PROTECT YOUR PLANT AND GUARD YOUR MEN



DOUBLE EXTRA HEAVY VALVES

"Every Valve Sold With a Positive "Guarantee."
"Hosts of References."

4100

Golden-Anderson Life and Property Insurance Valves are used in the iron and steel industry. Their repeat orders are the result of assured protection.

These Golden-Anderson Double Extra Heavy Patent Valves give absolute protection in case of back flow, pipe explosions, or admission of steam to cold boilers.

1—Instant isolation of a boiler in the event of a bursted tube or any other internal break causing a sudden drop of pressure.
2—All steam flow cut off the moment a steam line breaks at any point in your plant.
3—Boilers automatically cut in and out of service to equalize the pressure. This eliminates cutting in a fresh boiler by hand.
4—Cannot be opened by hand unless provided with patented safety latch attachment. It prevents the possibility of admitting live steam to a cold boiler.
5—No pounding, chattering or sticking. The perfectly cushioned double Corliss Dash Pot insures positively quiet seating.
6—The only valves that can be tested from the boiler room floor.



Golden - Anderson

Automatic Cushioned Water Pressure Regulating Valves

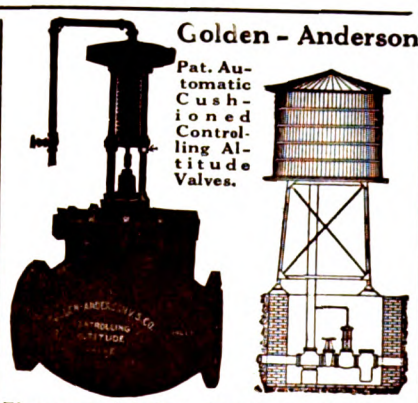
Will establish positively, steady reduced water pressure.

Easily adjusted from the outside.

Fitted with patented safety piston to remove danger of high pressure from reaching low pressure side. Cushioned by water and air.

No shock in seating.

Sizes to 30-inch.



Golden - Anderson

Pat. Automatic Cushioned Controlling Altitude Valves.

Three ways of closing: Automatically by water, electrically from distant points, and by hand. Sizes to 30-inch. No Float or fixtures.

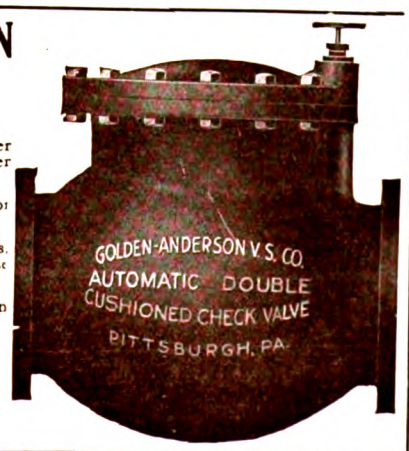
GOLDEN ANDERSON

Patent Automatic Double Cushioned Check Valve

1—Perfectly control the reverse flow of water in case pump stops to eliminate water hammer or shock.
2—Can be adjusted to operate either quickly or slowly.
3—Especially adapted for irrigation systems, water works, etc., having disastrous reverse flow of pressures.
4—Perfect cushioning obtained by water in opening and closing.

Sizes to 30-inch Angle or Globe Pattern.

Especially adapted for Hydraulic Elevator Service.



Golden-Anderson Valve Specialty Co.
1306 Fulton Building, Pittsburgh, Pa.

Digitized by Google

MORRiS PUMPS

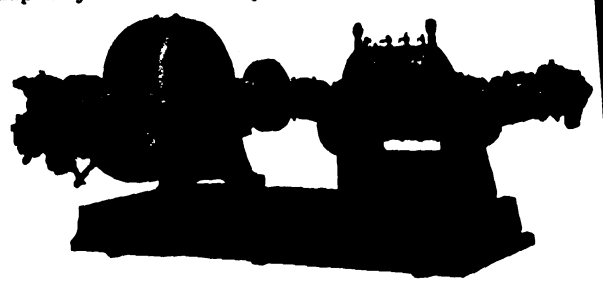
Are always making and breaking Records

Morris Pumps everywhere are meeting all demands and doing the work better. These pumps are being installed in ever increasing numbers for fire protection. For boiler feed, they are rapidly displacing reciprocating pumps. Morris Pumps are equally effective in pumping fresh or salt water, acids or other liquids as in pumping unscreened sewage or the products of hydraulic dredging.

Whatever your requirements,—your pump should be Morris Centrifugals.

Our engineers will gladly analyze your pumping problem to insure the selection of the most suitable pump for your needs. Drop a line today

Since 1864 Builders of Dredges, Centrifugal Pumps and Steam Engines



Centrifugal Turbine Driven Boiler Feed Pump

MORRIS MACHINE WORKS
200 Genesee St., Baldwinsville NEW YORK

184,635 Defective Boilers

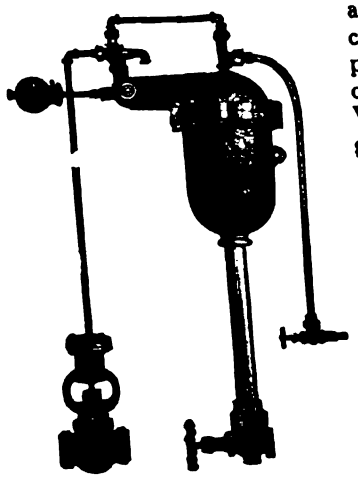
among those inspected last year—

so reports the Hartford Steam Boiler Inspection, Hartford, Conn.

You may not be able to break any boiler efficiency records but you can absolutely safeguard against explosions because of low water by installing a Vigilant Feed Water Regulator. The Vigilant holds the water to a given point. This assures that coal will not be needlessly wasted.

Too much trust cannot be placed in the human element. It is a known fact that today automatic boiler devices such as the Vigilant Feed Water Regulator are largely responsible for the high efficiencies and perfect safety at which hundreds of thousands of boilers are operated.

VIGILANT Feed Water Regulator



The Vigilant Feed Water Regulator is the premier regulator in the field and has been giving steady, reliable service for more than 25 years. There are no complicated parts to adjust or to get out of order. And it cannot fail to operate because it depends on gravity for its action. If only for the protection it affords, the Vigilant Feed Water Regulator is a good investment for you.

Just ask for the catalog

The Chaplin Fulton Mfg. Co.
28-36 Penn Avenue
Pittsburgh Penna.

(*Continued from Page 54*)

to get the same result with less labor have been invented. One of the simplest and most satisfactory of these is the integrating sphere mentioned above. This is simply a large, hollow, white-walled ball, inside which a lamp can be placed with a small window so that the brightness of the inside wall can be observed. The light is reflected back and forth between different parts of the white surface, and the sphere has the peculiar property that every part of its surface automatically sends to every other part exactly the right fraction of the light, so that the reflected light falling on the window correctly represents the total amount of light produced by the lamp.

This is true even when the lamp gives all its light upward or downward or in any other direction as well as when the light is given off in all directions. Consequently, a single measurement of the brightness of this window shows the total light given by the lamp.

Putting the Cause in Business

BY R. L. HARLOW

IF all the reasons pounded for better employer-employee relations were catalogued they would naturally and automatically fall under two main heads:

1. Moral.
2. Business.

While it would seen unnecessary to continually emphasize the employer's obligation to his employees, to his community and to his state, much will always be written on this subject; and it is all good medicine. For, I submit that any employer who is so blind as not to recognize this moral obligation toward his employees is equally blind to his obligations to the public. Conditions such as these eventually right themselves, which is another way of saying that such an employer will never be successful. (I am not measuring "success" necessarily in dollars and cents.)

Books published on this subject in the past ten years are legion, all of more or less good common sense and worth while, but writers must go a step further. It is not enough to write a book which, when read, goes on the library shelf there to lie unheeded and forgotten. Writers must take off their kid gloves and go at the subject with bare fists.

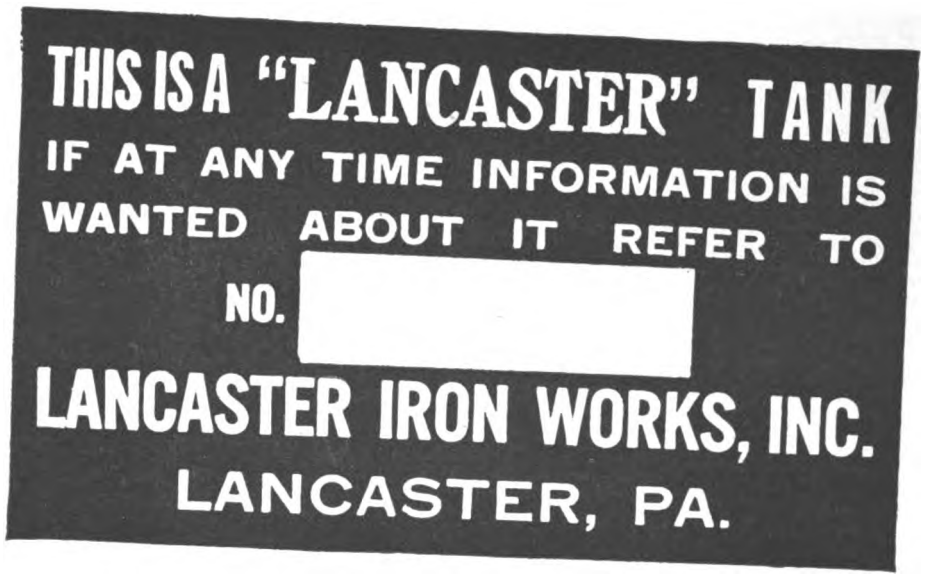
Managers, as a rule, are anxious to be good, but it is not enough to preach of future spiritual rewards by such conduct. They must be shown, and in no uncertain terms, that not only is the time yet far distant when the general public, or competition, if you will, will force equitable relationship between employer and employee—but, and what is vitally more important,—that such fair dealing, just and equitable conditions pay; that the man who has rightly solved the problem of employer-employee relations or even he who has made the most conscientious effort toward this end will make *the most money*. Badly put, mayhap, but nevertheless a fact.

Now, let us analyze human nature for a moment. What goes to make a good man? Is hears is real, living truth? As mitting that he has not gone to sleep and that all that he listens every Sunday, even adit the sermon to which he a matter of fact, the sermon has very little to do with it, if we are willing actually to face the truth. Why, then, is he honest? *Simply because it does not pay not to be honest.* No man who does not live up to the accepted practices in business of right and wrong can long succeed any more than he can succeed socially in his community.

But too often the moral obligation is given secondary consideration in the mind of an average employer who contemplates employee plans of any sort. The paramount question is "What does it cost?" "What shall I get out of it?" "Is it an expense or an investment?" The proof of

(*Continued on Page 59*)

Digitized by Google



RESPONSIBILITY

WHEN considering your Tank requirements, place the burden of responsibility where it belongs.

By knowledge, training and experience, the Lancaster Iron Works, Inc. is the logical choice for such responsibility.

The Lancaster Name Plate on your Tanks is assurance that they have met the responsibility in a way that makes the product worth all that it costs.

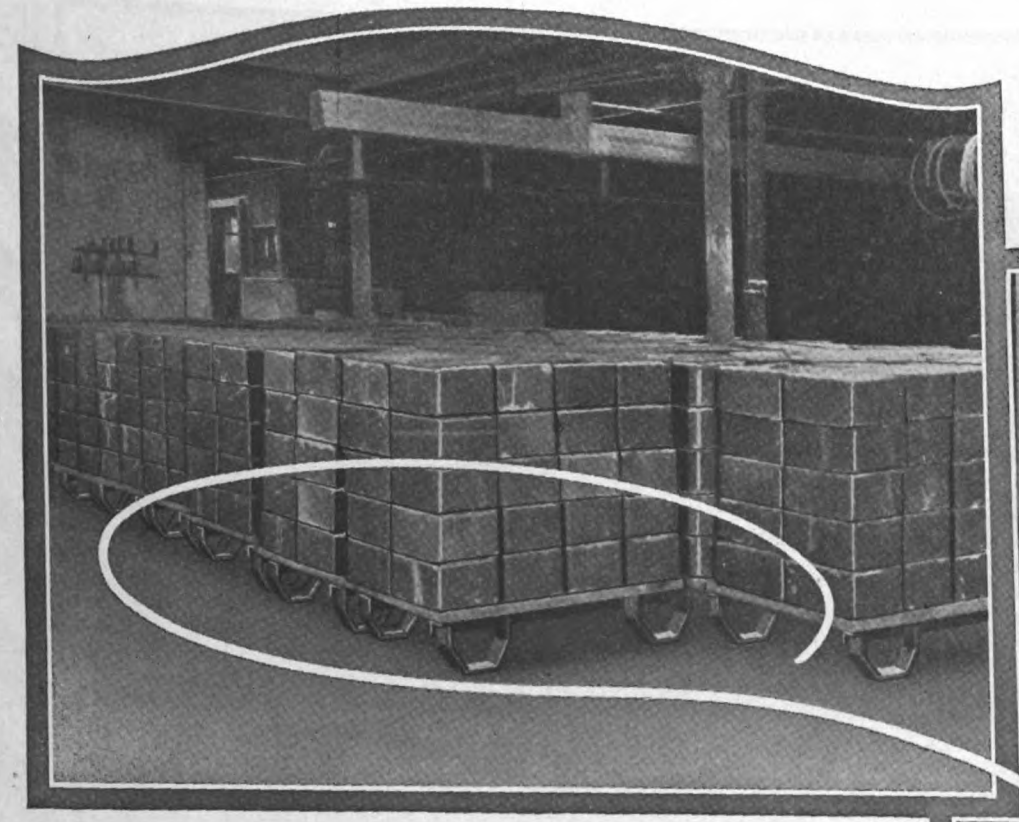
If you do not have our three valuable booklets on Tanks, we will be glad to send them upon request.

Lancaster Iron Works, Inc., Lancaster, Pa.

501 FIFTH AVENUE, NEW YORK - - - WESLEY BUILDING, PHILADELPHIA, PA.

LANCASTER TANKS
STEEL PLATE CONSTRUCTION

Digitized by Google





It Pays—
A Few Inches Raise

These few inches often mean the difference between savings and waste.

Goods and materials placed, piled, or stacked on the floor must be loaded and unloaded by hand every time they're moved. This is waste—in time, labor, equipment, money.

The "few inches raise" will convert this waste into many dollars of savings—cut down payroll expense, speed the movement of goods and materials, and economize in equipment and equipment maintenance.

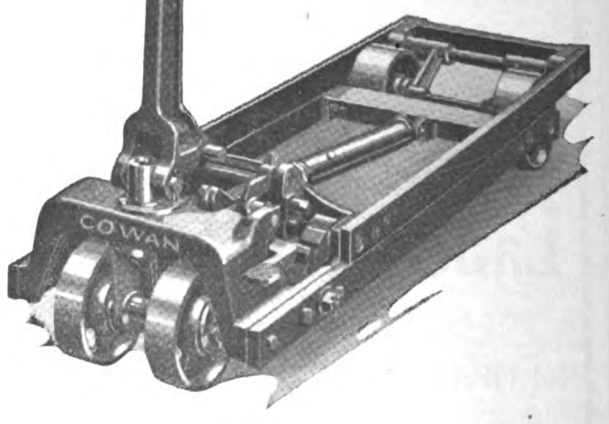
Cowan Skids provide the "raise." Just as easy to use skids as it is to use the floor. Then one man and a Cowan Hand Lift Truck can pick up, move, and deposit loads weighing even thousands of pounds. No repeated hand loading and unloading, stacking, and restacking. No extensive equipment of platform or other similar trucks. Simple, inexpensive Cowan Skids and a few Cowan Hand Lift Trucks comprise the equipment that is eliminating the wastefulness of rehandling for thousands of concerns throughout the country.

No matter whether your problem is one of moving goods and materials from one manufacturing process to another, from department to department, from building to building, or is one of storage—whether you handle castings, lumber, boxes, bales, or what not—we have a message of enonomy for you that is worth while and convincing. A Cowan representative will gladly present it to you or we shall be pleased to send you bulletins and other information by mail.

COWAN TRUCK COMPANY, 6 WATER ST., HOLYOKE, MASS.
N. Y. Office: Grand Central Palace. Offices in Principal Cities
Largest Manufacturers of Complete Hand and Electric Industrial Truck Systems

One man with a single downward stroke of the Cowan Truck handle picks up skid and load.

Pressure on foot pedal lowers skid and load to floor, quickly and gently.



2060-N

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

Digitized by Google

(Continued from Page 56)

this statement is, for instance, the conditions that existed in this country during the late war. Employers of every type and in every industry rushed about madly looking up employee schemes, bonus plans, industrial democracies and what not.

The Personnel Manager, another name for a humanized efficiency engineer, became a factor in every business. Why, because the war had awakened a latent sense of moral obligation toward the worker? Not at all! But because the business of these men could not succeed, *because they could not make money;* or if the pill must be sugarcoated, because they could not longer serve the community unless they could get and hold employees or labor.

The war came to an end. The "boys" came home. War work ceased and labor once more was easily available. From one end of the country to the other personnel managers were discharged; personnel work stopped almost over night. Yet the problem had existed long before the war and it is just as pressing today.

The only real hopeful sign at present is that while business men may have forgotten the economic lessons of the war, schools and colleges have grasped the importance of the problem and today they all include business courses, with special emphasis on employer-employee relationships, in their school curriculum.

Once again may I say that what the business man must be shown first, last and all the time is that just, equitable, humane relationships pay the biggest dividends,—that the employer who has the *enthusiastic* loyalty and coöperation of his empoyees *will make more money* than the mere contractor of labor. It follows, of course, that the employees also will benefit in proportion to the success, and only in proportion to the success, of any business.

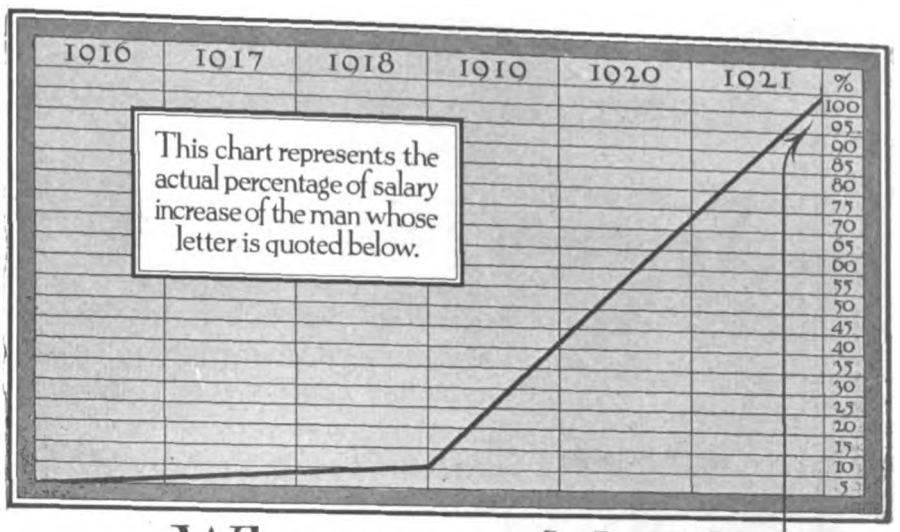
"But," says Mr. Average Employer, "I have tried these schemes at one time or another, and the employees themselves do not use them. I have built for them a club house; I give them lunches at noon; I have given them a library; I have paid for their entertainment, etc., and what does it amount to?" The answer is readily found in analyzing that first statement, "*I* have given them, *I* have, etc."

Let us suppose that the Mayor of a town, on a generous impulse, built club houses for the business men of the city. Would they use them? Supposing the Chamber of Commerce laid down as a prerequisite for carrying on business in the city a membership in certain mutual benefit associations, or that business men must dine at certain restaurants. Granted that the thought in the minds of the Mayor and of the officers of the Chamber of Commerce were of the highest and the club and restaurants of the best, would the scheme work? And if not, should the business men be condemned? Further, and what is still more important, *shall we say, therefore, that all clubs and all restaurants were a failure?*

Owners there are who will never learn or freely acknowledge that those in their employ are human beings with likes and dislikes as necessary to their happiness as are their own. First let us find out what your people really want and then *help them* to get it. How? A perfectly logical question too. Well, it is often difficult, as everyone knows, to discover just what the members of one's own household really would like, say for gifts at Christmas time. This is a complaint so common, that it is the season's joke. And yet it can be solved if a resolute attempt is made.

Again, the proud father says "I am going to bring my boy up to be a lawyer or a doctor." Absurd? All the father can possibly do if he is to be a successful father is to guide that boy in the way the boy himself wants to go, provided always that the youth has had an education and experience to make an intelligent choice. One reason we have so many business failures is the determination on the part of parents to make unsuccessful lawyers and doctors out of what might have been successful bankers or mechanics.

The same rule holds in your business family. The responsibility, Mr. Manager, devolves upon you to find out, so far as is humanly possible, what are



What caused that?

ORDINARILY we subordinate the discussion of financial advantage in presenting the business value of the Alexander Hamilton Institute training.

But there is a very practical-minded type of man who insists on asking: "Just what will this mean to me in earning power? How can I *know* that the Modern Business Course and Service will help me to increase my income *soon?*"

This advertisement is written to answer that question very frankly. And the simplest way to answer it is to take, from the Institute's files, one of the hundreds of letters reporting salary increases and analyze it.

Here is such a letter, written by an official of an internationally-known concern. Let us see what prompted him to send for "Forging Ahead in Business" (the little business guide book offered below) and just what happened to him, and his income, as a result of that decision.

"After having spent several years doing the routine work connected with general business," he writes, "I worked myself up to a position in charge of a small force, but at this point

My advancement seemed to stop"

(He was just one of the many useful cogs—useful enough to be rewarded with little salary increases, but not useful enough to promote.)

"In this state I was naturally dissatisfied," he continued. "One day I made up my mind to call upon a well-known business man and inquire about an attractive position which he had to offer. His first question was:

" 'What do you know about business?'

"My many years of experience did not even afford me the ability to return an intelligent reply. Seeing my embarrassment the other man said:

" 'I am a graduate of a big university and have also completed the Alexander Hamilton Institute Course; but I consider the Course a far greater asset to me in the business world. My advice to you would be to investigate some good business study course.' "

The young man went out from that office and sent for "Forging Ahead in Business." The letter which is quoted above was written after he had completed the Modern Business Course and Service, and says:

"The main purpose of your Course has been accomplished to a great extent:

My salary has been increased about 100 per cent

since enrolling, but from the outlook this is only a small portion of the benefits still in store. Your Course has given me *confidence.*"

There is nothing to be added to the letter. We merely invite the men who read this advertisement to check their own business experience against the experience of the writer on these three points:

1. He had gone along for years with small salary increases, and his business progress seemed to have stopped. Can you look ahead to a time when this will be true of you?

2. He had an opportunity and it slipped out of his fingers because he did not know enough about Business to impress the other man. Are there opportunities of this kind that pass you by for the same reason?

3. He lacked confidence. He knew one little part of business. But just as the salesman flounders when the discussion turns to accounting, or the factory man is out of his depth in the discussion of corporation finance, he was embarrassed whenever a subject came up outside his one little department.

It is the function of the Alexander Hamilton Institute to make a man at home in the discussion of any department of business, by giving him the fundamentals underlying all departments.

"Forging Ahead in Business"

We invite you—as we invited him—to send for "Forging Ahead in Business." The training of the Alexander Hamilton Institute may or may not be what you need. Only you can decide. But surely the facts are worth an hour of your consideration.

"Forging Ahead in Business" gives *all* the facts. Sending for it has been the first step toward larger income on the part of many thousand men, including the man whose letter is quoted on this page. A copy is waiting for you.

Alexander Hamilton Institute

663 Astor Place, New York City

Send me "FORGING AHEAD IN BUSINESS," which I may keep without obligation.

Name.....
Print here

Business
Address.....

.....

Business
Position.....

Canadian Address, C. P. R. Building, Toronto; Australian Address, 42 Hunter Street, Sydney

Copyright, 1922, Alexander Hamilton Institute

Digitized by Google

REG. U.S. PAT. OFF.
TRADE JENKINS MARK
Jenkins Bros

Years of Discretion—

Early in their career, Jenkins Valves proved themselves to be thoroughly *good* valves. Since then they have proved themselves thoroughly *dependable* valves, by never once deviating from that standard of perfection.

Today, after fifty-eight years' experience, years of friendships made and kept, they are recognized as *the* valves of *the* dependable service.



Identified by the Jenkins Diamond Mark and Signature—at supply houses everywhere.

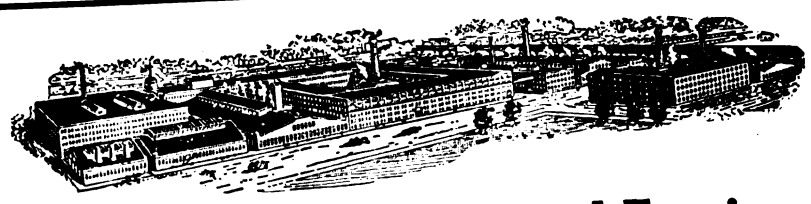
JENKINS BROS.

New York Boston Philadelphia Chicago London Montreal

FACTORIES: Bridgeport, Conn; Elizabeth, N. J.; Montreal, Canada.

Jenkins Valves

SINCE 1864



Replace Your Castings and Forgings *with* STAMPINGS—SHEET METAL PARTS

Stampings and sheet metal parts made in the G. P. & F. plant are lighter, stronger and often much cheaper than Castings, Forgings or even wooden parts.

Thousands of customers in every line of industry are now availing themselves of this service.



Stampings are always accurate and they eliminate machining and fitting.

Huge batteries of specially equipped presses are available to handle any job.

Stamping, Forming, Drawing, Punching, Pressing, and Spinning in Steel, Aluminum, Copper, Zinc, Brass or Tin.

Estimates furnished promptly on receipt of your blueprints or samples

G.P.&F. Service

Send samples or specifications. Let us show you how we can lower your costs and improve your product. Write today.

Geuder, Paeschke & Frey Co.

1300-1800 Canal St., Milwaukee, Wisconsin

Detroit Office, 712 Dime Bank Bldg. Chicago Branch, 352-358 W. Ohio St.

the ideals, likes and the dislikes of those dependent so largely upon you for their future success, because you, as the living, constant example of success in their chosen field, are accountable more than any other one factor for the daily mental attitude of those who come constantly under your influence.

Because right guidance is your moral obligation to your employes and to the community.

Because right guidance will pay you ultimately even in actual dollars and cents.

No manager can evade this insistent obligation. Building hospitals or endowing libraries may make you a bigger man publicly. Developing human beings and guiding them to truest success will make you a much larger man both morally and socially.

It is not easy to find out what your employes really want, even in their business life, and you argue, not without reason, that you are too busy with the large problems ever confronting you to study out the puzzle. My answer, first, is that this in itself is one of the largest problems you will ever be called upon to face. A correct solution is difficult to state. But first make the effort, not once and then stop and declare the whole idea a failure, but constantly, every business day, and through every possible agency. Have you asked yourself in candor if, after all, you are the type of man who can find out? Have you ever made any genuine effort to know your people as you know the ledger figures of your business? Remember figures are the effect; your human element is the cause. Have you in downright earnestness studied the cause.

The average executive says he has. My answer is that generally he is merely deluding himself. Not one man in a hundred has ever made a deep study of the human side of the business. Let me ask you a question to prove it. Do you really know what your people think of you? I don't mean what they call you to your face, but how they speak of you in their own homes and among themselves? Do they refer to you as the "Big Boss," "Old Man," "Old Grouch," or are

(*Continued on Page 63*)



STICKERS

Bright, snappy advertising stickers *that stick*—applicable anyw ere to anything—economic and persuasive. Every business needs them. Also a complete line of Standardized Stickers ready for shipment in amounts from a thousand to millions. All kinds of labels.

Our price book in colors will save you money. Send for it.

ST. LOUIS STICKER CO.
1625 Washington Avenue ST. LOUIS

Phone for Demonstration
KARDEX
TONAWANDA, N.Y. BRANCHES EVERYWHERE

This Issue of Industry Illustrated is Typical of the Broad, Interesting and Helpful Service it is Constantly Rendering.

ONLY the service is continually getting broader more interesting and helpful.

Wonderful as has been the array of timely articles and illustrations it has been presenting to its readers right along, from the very beginning, it is only beginning to scratch the surface of the immense possibilities that lie in the power of the camera to catch for the busy man vitally important and useful information that he would otherwise pass by.

Great things are coming. You will not want to miss them, even if, by any chance, you might think you can afford to miss them.

If you are already a subscriber, see to it that your subscription is renewed promptly. If you are not now on our lists for your own personal copy, put yourself there at once. See this coupon below?

Mail this Coupon TODAY

Industry Illustrated
120 West 32nd St., New York, N. Y.

Send me a copy of Industry Illustrated every month for a year. I shall remit on receipt of your bill—in the next 30 days or so. (If a renewal of a present subscription, check here.....)

Name.....

Address.....

Company..... Title.....

Annual Subscription Price, $1
In Canada, $1.25; Foreign, $1.50

(AD-L)

Digitized by Google

Now Ready—a book that shows what can be done in Power Plant Efficiency by telling how it has been done

"Mastering Power Production"

By Walter N. Polakov

Consulting Engineer; member, American Society of Mechanical Engineers; member, The Taylor Society; honorary member, National Association of Stationary Engineers; etc.

455 pages—138 illustrations—bound in red cloth—$5, postpaid—sent on Free Examination

Victor J. Azbe, Consulting Engineer, St. Louis, Mo., writes, "Allow me to congratulate you on your very able book 'Mastering Power Production.'

"I am reading it with great interest and the information I absorb will be of real value to me. There are numerous books and papers published stating how to attain power plant efficiency but none of them give reasons why economy should be practised in not nearly as admirable a way as you do. From now on, your book should be my bible which I will read as an inspiration for better work."

A Most Unusual Book

Unique in its Scope, its Plan and its Method of Treatment

CONTENTS

Preface

Introduction—The Descent of the Principle of Production for use.

1. The Power Industry as an Economic Factor.
2. The Location of Plants.
3. The Equipment of Plants.
4. Mastering Materials.
5. Mastering Maintenance.
6. Mastering Labor Problems—Conditions.
7. Mastering Labor Problems—Compensation.
8. Mastering Processes.
9. Mastering Records.
10. The Analysis of Expenses.
11. Power as a Commodity.

Index.

MASTERING POWER PRODUCTION is a crystallization of a ripened, broad and intensive EXPERIENCE. Walter N. Polakov tells of things which have been accomplished in the power plant field—things which have passed the experimental stage, although not yet become general practice.

These things have cost him countless hours of study and experimentation, and his clients large retaining fees to utilize—he now passes them on, in his book to all who can make use of them in working out their own problems of production, costs and human relations.

It presents a wealth of new Methods in Management which Experience has amply demonstrated will lead to REDUCED COSTS, MORE EFFICIENT OPERATION, EXPANDED PRODUCTION and Better Human Relations—in the Power Plant and throughout the Factory.

Power superintendents and engineers, central station officials, public utility executives, factory managers, consulting engineers, economists and students of human relations will find "Mastering Power Production" invaluable and profitable. The author's discussion of power production and utilization and the physical, managerial, economic, social and psychological factors entering into the purely engineering task of getting the best results out of existing equipment, materials and operatives is brought out so clearly and with so many examples from his own wealth of experience that no executive can well afford to be without this wonderful edition.

The book contains a score or more of half-tone reproductions of photographs; half a dozen triple page inserts and many invaluable charts, maps, logs and diagrams, most of them never before published. There are also a number of data tables twelve pages of appendices, eleven pages of footnotes and a copious index.

So convinced are we that you will agree with us as to the merits of "Mastering Power Production" that we shall be glad to send you a copy on ten-days' approval with the privilege of returning it if it does not come up to your expectations.

The Author

has served the New Haven Railroad as superintendent of power; the Board of Estimates and Apportionments of the City of New York as expert engineer for municipal plants; and, during the war, the United States Shipping Board Emergency Fleet as power expert. In the public utility field he established a record for economical operation, both on electric railways and in central stations, his pioneer work for the Penn Central Light and Power Company particularly receiving much attention.

Send No Money Now

Simply fill in the coupon and mail it at once. This book will be forwarded at once, If you decide to keep it, you may remit $5 within 30 days. Get the coupon off in TODAY'S mail.

Free Examination Coupon

The Engineering Magazine Company,
120 West 32d Street, New York.

Send me Polakov's new 455-page book, "Mastering Power Production"; I shall either return it in 10 days, or remit the price, $5, in 30 days.

Name .....

Street .....

City ..... **State** .....

Digitized by Google



From
Receiving to Shipping

all through the plant—in every department—Cleveland Tramrails will greatly reduce the time, labor, and cost of handling your products.

No system has ever been devised that so adequately adjusts itself to every hoisting and conveying need requiring two tons or less capacity.

It's easily installed—just like hanging a pipe line. The entire system is standardized—permitting additions whenever necessary. Corners can be turned; carriers switched from one rail to another; and elevators equipped to hoist carriers from one floor to another. It will even travel up a 12½ degree incline. In fact it will go anywhere—from cellar to attic—indoors or outdoors.

There is a Cleveland Tramrail installation that will serve your individual needs.

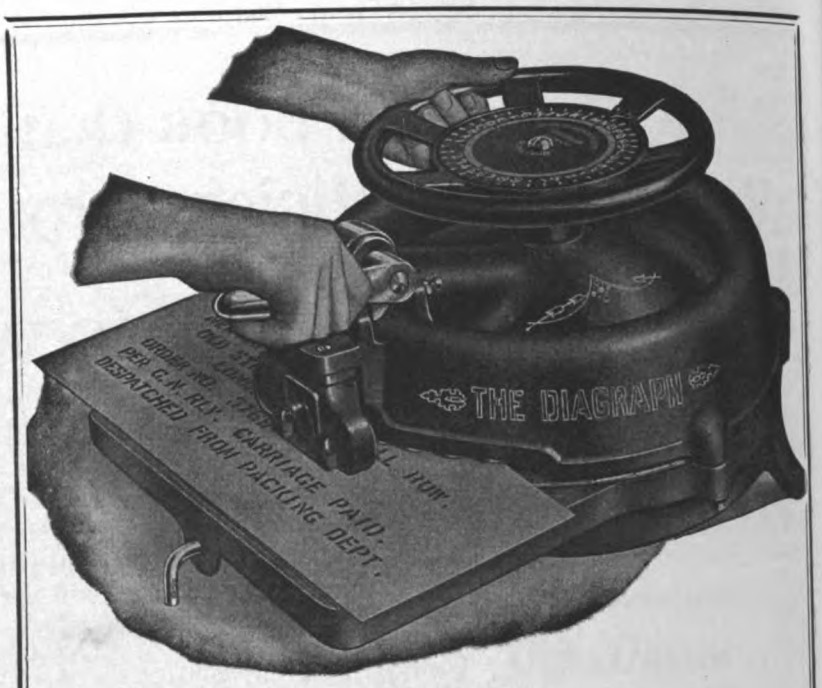
We would prefer to analyze your plant and suggest the proper installation. May we?

Our catalogue may interest you.

CLEVELAND ELECTRIC TRAMRAIL
DIVISION OF
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE, OHIO.

Sales Offices:
50 Church Street, New York City
149 E. Larned St., Detroit, Mich.
Farmers Bank Bldg., Pittsburgh, Pa.
1418 First National Bank Bldg., Chicago, Ill.

CLEVELAND HAND OR ELECTRIC TRAMRAILS



READ
"The Freight That Failed"
By Forrest Crissey

Every business man should read this illuminating article in the May 27th issue of The Saturday Evening Post. Mr. Crissey, in discussing the $100,000,000 annual freight claim losses, states that the use of stencils for addressing is a highly effective means of loss prevention. Read Mr. Crissey's article—then buy a Diagraph. Free trial in your own shipping room.

DIAGRAPH STENCIL MACHINE CORP.
1626 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities—see phone book.

POWELL VALVES

Backed by 75 Years Experience

Powell Triple Acting Valves automatically close when a tube bursts —isolating the boiler.

POWELL WHITE STAR VALVES

are a combination of the most serviceable mechanical factors insuring to the user unfailing dependability.

Two reasons for their long life are their regrindable, renewable disc, both cast of Non-Corrosive Powellium Nickel.

Medium and extra heavy for steam working pressure up to 200 and 300 pounds.

SEND FOR DESCRIPTIVE CIRCULAR

Fig. 2228



The Wm. Powell Co.
2525 SPRING GROVE AVENUE
CINCINNATI, OHIO

Digitized by Google

(*Continued from Page 60*)

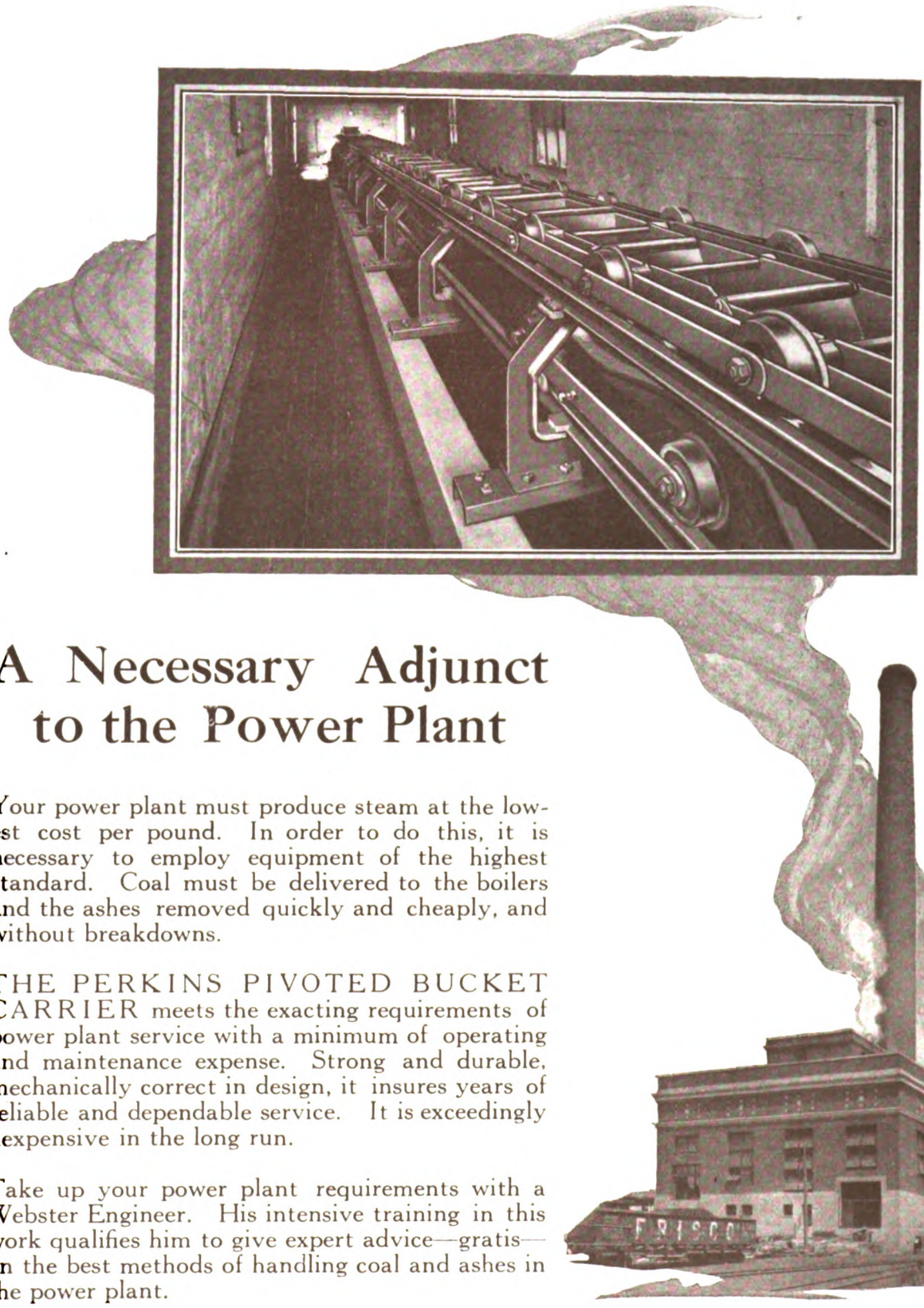
they using some more kindly term? What are your executives saying about you around the noon lunch table? You don't know and you are afraid to inquire, for your first impulse would be to "fire" as disloyal an employee who wasn't respectful in his reference to his executive head.

Obviously, it takes a big man to make this study. But this is the first job you have before you. Have your people any profound confidence in you as a *man,* or is it merely respect for your business ability? What have you done or are you doing to instill such true respect on the part of your employes for you as a leader, as an exemplar? What employe would venture to tell you that the joke just worked upon him and that he laughed at was old when he was a baby? You'd tell your partner quickly enough and one employe would not hesitate to tell another, but he would not dare to tell *you* and you wouldn't dare let him.

It is time you, figuratively speaking, got out of your expensive automobile, got down on the ground and rode in the flivvers and street cars with your employes. The "powers that be" didn't give you your success because of some peculiar characteristic personal to you but not common to humanity in general. There are probably now many men in your employ whose potential ability is even superior to yours. Is not the effort to discover it worth while in order that it may be capitalized to both yours and the employe's advantage? Consider that suggestion a moment.

The rule that responsibilities go with power is just as true in your case as it is in that of your minor executives. Greater even, for you have an added responsibility—that to the whole community. When you go through your store or factory are you wearing scowl or a smile? Do your people work harder (which truly analyzed is "bluff") when you pass by than they do when you are out of sight, in your office? Is your presence a signal for "Look out; here comes the boss!" Remember as a boy, "Cheese it, the cop!" Are you "always looking for trouble"; is that the impression you give, or are you really watching for opportunities to help to the mutual benefit of both the employe and yourself? Do your employes freely come to you for solution of their business problems which, after all, are your problems, or had they rather take a chance on the solution themselves through fear of you? Put simply: are your employes at any hour you may appear glad to see you? Are they proud because you are their executive? Are you the ideal personification of business success in the minds of the majority of them?

These questions are all real, ever present. They are vital to your greatest success. True, full answers might give you some uneasiness; but the chances are better than even that the solution of many of your own business difficulties might be found in them. Mr. Manager, if you'll stop trying to be a big boss and start try-



A Necessary Adjunct to the Power Plant

Your power plant must produce steam at the lowest cost per pound. In order to do this, it is necessary to employ equipment of the highest standard. Coal must be delivered to the boilers and the ashes removed quickly and cheaply, and without breakdowns.

THE PERKINS PIVOTED BUCKET CARRIER meets the exacting requirements of power plant service with a minimum of operating and maintenance expense. Strong and durable, mechanically correct in design, it insures years of reliable and dependable service. It is exceedingly inexpensive in the long run.

Take up your power plant requirements with a Webster Engineer. His intensive training in this work qualifies him to give expert advice—gratis—on the best methods of handling coal and ashes in the power plant.

THE WEBSTER MFG. COMPANY

4500-4560 CORTLAND ST., CHICAGO

Factories Tiffin, O. *and* Chicago-Sales Offices *in* Principal Cities

Digitized by Google

DON'T GAMBLE With Temperatures!

In many manufacturing processes which call for the use of liquid solutions at given temperatures, it is sheer gambling to depend upon the uncertain "human element."

Sooner or later the man who is "infallible" proves that he is *not* infallible. And then—he takes his hat and coat off the peg and walks out of your plant with a pink slip in his envelope.

But does that save your goods? And does it save your good name? How many times in the past have inferior goods gone out to undermine your reputation?

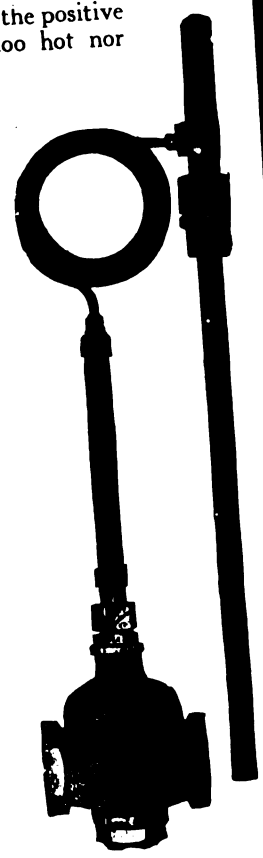
All doubt in this connection is instantly ended by that reliable, sure-control device, the Sarco Temperature Regulator. It can't make mistakes. It can't go wrong. Once set for a given temperature it maintains that temperature faithfully. It gives you the positive assurance that your solutions are neither too hot nor too cold—that your goods will not be ruined in process of manufacture, day or *night*.

Simplicity is the keynote in the construction of this instrument. The prime agent in the control of heat-volume is an expansion-and-contraction element controlled by a super-sensitive liquid.

There are no outside devices to invite breakdown and expensive repair. No electricity, water or compressed air. The Sarco is entirely self-contained. Compact—small in size—durable. And lower in price than any other temperature regulator.

Sold on 30 Day's Free Trial.

For Full Particulars Write for Booklet No. R-67



SARCO CO., Inc.

236 Broadway, New York City

Buffalo Chicago Cleveland Detroit Philadelphia

SARCO TEMPERATURE REGULATOR

ing to be a big man you'll be surprised how much fun there really is in the life of each day. Again, I want to emphasize that the likes and dislikes of your employes are not dissimilar to your own. Are they?

What, after all, is your chief desire in business? A better income honorably earned and better living conditions? Have you any employe whose desires are not just that?

Above all, cease putting yourself in the position of final judge as to the total, real ability of your people. What right have you to say whether the salesman today may not some day be a bigger man than yourself? If you look around at the business world, you'll find that ninety percent of the guesses made in school as to the future of the boys were wholly wrong. If teachers and parents can't guess correctly, I ask, by what authority do you so confidently predict their future?

You want, perhaps, another automobile; your employe may long for a fur coat. The chances are about even that you can't afford the coveted machine any more than can the employe the coat. By what abstract right, therefore, do you criticize that employee's expenditure? Is there not a beam in your own eye?

Study your people, Mr. Manager. Cultivate them. You need them just as much as they need you, and you'll be surprised after a while what a really splendid lot of boys and girls you have working *with* you all along.

So much for the boss!

Now then, what do I mean by the "cause" in business? All ventures fail or succeed largely upon the *individual appeal of the cause of the venture itself*. As applied to modern business, the future of our establishment depends in the last analysis upon the extent to which we can make the cause of that business a real individual responsibility of the employe and not merely of the Management.

Let me give a real example of a "cause." Suppose we decide to go into the business of war. We start out to "hire" an army, we tell our applicants that they will be subjected to the most rigid discipline, they must obey without question every command; they must give up all home ties and finally be prepared to sacrifice if necessary even life itself. For all this service we agree to give them sufficient clothes to cover them, food and housing and thirty dollars a month. I am asking you now to think of this purely from a business standpoint. How many men do you think you could enlist? But inject into the proposition the plea of "patriotism." Then sacrifices of no kind are too great to be made for that cause.

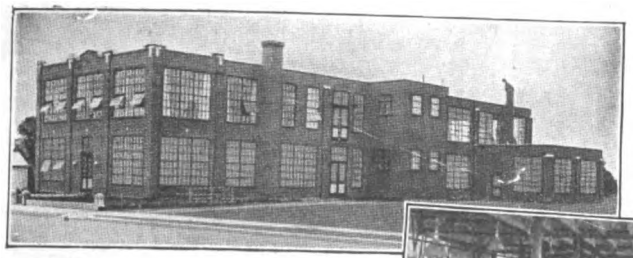
To put it differently. Take a company of soldiers in a trench. Orders have come through to kill or drive out the enemy and capture a certain wood. In the minds of the officers it is good business to pour as much shot into that wood as possible. The men, therefore, are given their orders and are told where to fire, and just when to open up. Then every officer in the command,—representing your executive in business,—passes up and down the line critizing the way Private Jones or Corporal Brown holds his gun and the fact that Private Brown shot out of turn, while Private Smith didn't even look where he was shooting. What becomes of the "cause" under such circumstances? But along comes a new captain. He explains to his men with earnestness, clearness and enthusiasm that the "one big job ahead of this company is to take that wood," and then adds, "Follow me!" Is there then any question of the result?

We often hear in business that "what we actually need in this establishment is more discipline." And I heartily agree. We all need more discipline. *But* how many of us know that the word discipline comes from disciple, and a disciple is a follower? What we need surely is more discipline, and in order to obtain it, we must have leaders, not task masters.

One trouble with most managements today is their desire to drive instead of lead, a course which immediately kills the "cause." The outstanding figures as leaders in all wars are not the officers who directed the battles from points miles behind the lines, but the officers who were seen

(*Continued on Page 67*)

Digitized by Google



The Royerford Needle Works
erected in 47 days including entire mechanical equipment and installation of machinery.



—INTERIOR—

Your New Building

IT can represent every modern improvement and yet be built in 30 to 90 days at a big saving, if you use Beling-Bush Standardized Buildings. Using our Method, you save because of centralized responsibility and on cost of plans and specifications. Write for booklet and information, and let us estimate.

Minimum Cost *Maximum Service*

The BELING~BUSH CO., INC.
FACTORY ENGINEERS AND BUILDERS
Drexel Building **Philadelphia Pa.**

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width	$10.68
9½ " "	11.93
11½ " "	14.00
12¼ " "	15.45
13 " "	16.00
14 " "	17.59
15 " "	18.84
18 " "	22.00
18¼ " "	22.90
24¼ " "	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. ***Our Customers will benefit.***

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company

(An Independent Corporation)

ROCHESTER, N. Y.

DESIGNERS AND MANUFACTURERS — PEARCE — COMPLETE SERVICE — APPRAISALS AND INVESTIGATIONS

Who'll rear his fruitage from the seed
When orchards ripen to the skies,
Who'll struggle on with daily need
When vision gives him wings and eyes?
—*Ibsen.*

The Gift of Vision



TO BE ABLE to visualize "Empires in the Making" is glorious, but to make such dreams realities is an achievement worthy of the Gods. Such is the work of inventors, revolutionizers of industry, geniuses who give the best that is in them toward making dreams come true.

The House of Pearce is thankful for its vision, but more thankful because that vision has enabled it to participate in the development of so many noteworthy and successful inventions, including Typewriters, Telegraph Apparatus, Fire Alarms, Time Recorders, Radio Apparatus, as well as many others of equal importance.

We are, however, practical idealists—Ours is a sane vision based on the experience of 50 years which enables us to distinguish between gold and dross.

For sound counsel in production economy and successful cooperation in the development and manufacture of a new invention, or the improvement of an old one, who can serve you more profitably than a house whose eyes and ears have been opened in serving others in this capacity over so long a period of time, which is the true test of the survival of the fittest?

A copy of "Turning Losses into Profits"—The Book of Pearce Achievements —will be sent upon request on your business letterhead. Please address Dept. E

FREDERICK PEARCE COMPANY
Incorporated *Established 1872*
Industrial Engineers

18-20 Rose Street New York

"Trading for Over a Half Century on Successful Association with Leaders of Industry."

Just Suppose--

You had coming to you every month a big bunch of Pictured Progress such as you see in this copy of

INDUSTRY ILLUSTRATED

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name.....

Mailing Address.....

Company..... Position.....
(Important confidential information—for our own records only)

ANNUAL SUBSCRIPTION $1 In Canada, $1.25; Foreign, $1.50

Digitized by Google

THE LAY BROOM

Honestly Made



Fully Guaranteed

Standard for Forty Years



Pioneer and still Leader

For Forty-six Years The Joseph Lay Company has been making surpassingly good Factory Brooms. The best in the experience of ***three generations*** of broom-makers has been conserved and incorporated in our Lay Stapled Metal Case Broom.

We furnish Brooms for 90 per cent of the Steel industries; 40 per cent of the Railroads and more than 4000 industrials.

Cut Your Sweeping Expense in Two

The Lay Stapled Metal Case Brooms are made of the Best materials the market affords and are scientifically designed and constructed. As a result, they can do twice the sweeping possible with an ordinary broom and can do it better and faster.

You Run No Risk

Performance records prove their great economy. Every Broom unconditionally guaranteed.

Let Us Supply your Brooms

Push Brooms Metal Case Brooms Casting Brushes
Bench Brushes Flue Brushes Hickory Fibre

The Joseph Lay Co.

120 College Street
Ridgeville Indiana

Originators of the Metal Case Brooms

USE THIS COUPON

How can I reduce my Sweeping Costs?
My needs are as follows:

Name .....

Address .....

BYERS PIPE

GENUINE WROUGHT IRON

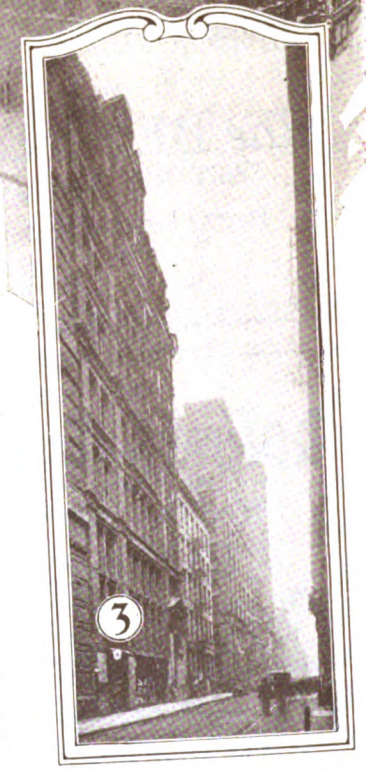
1 *Home of R. L. Patrick, Burlington, Vt. Architect, F. L. Austin. Byers pipe used for Plumbing, Heating and Vacuum Cleaner lines.*

2 *Masonic Temple, Chicago. Erected 1889. Byers pipe used for Plumbing and Heating Systems.*

3 *The old London and Liverpool and Globe Fire Insurance Bldg., New York City. Erected 1882. Byers pipe used for Heating System.*







40 Years' Service and Still Like New!

SUCH is the record of six miles of Byers pipe installed in the heating system of the old London and Liverpool and Globe Fire Insurance Bldg., New York City, erected 1882.

Another striking example among many is found in the Masonic Temple, Chicago, erected 1889, in which Byers pipe has for 33 years maintained its original serviceability.

Wherever you travel, equally impressive records of pipe durability can be found in old buildings equipped with the genuine wrought iron pipe—the only kind of pipe ever made by Byers. The Tacoma Building, Chicago, America's first skyscraper; the Iroquois Hotel, Buffalo; the German Insurance Building, Buffalo; Cleveland Arcade and Garfield Building, Cleveland—these are just a few notable examples.

In many of these buildings, plumbing and heating fixtures have been replaced by more modern equipment, but the old pipes have been left undisturbed, being in an excellent state of preservation after 30 to 40 years' service.

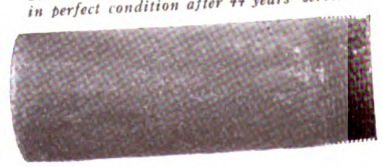
And this is a most fortunate circumstance, for cutting into walls, floors and ceilings to replace rusted-out pipes, is an operation entailing staggering expense, loss of rentals, endless confusion, and inconvenience to occupants.

Whether you build a home or a large building, Byers pipe is the most economical pipe to use for Plumbing and Heating. It represents the "happy medium" in *first* cost, and —due to its high rust-resistance—the lowest *ultimate* cost.

NOTE: Black or galvanized pipe of every variety is erroneously called "wrought pipe" or "iron pipe". Byers pipe is made by the old puddling process in use for over a century. The rust-resisting quality of the metal thus obtained has never been approached by products of cheaper modern processes. Byers is the genuine wrought iron. Judge its future by its past.



Genuine wrought iron pipe, from County Jail and Criminal Court Bldg., Chicago, in perfect condition after 44 years' service.



A. M. BYERS COMPANY
PITTSBURGH, PA.
Established 1864

New York Philadelphia Boston
Chicago Cleveland Houston



Send for Booklet, "On the trail of Byers Pipe"

Look for the Name and Year rolled in every length

Digitized by Google

(*Continued from Page 64*)

in the front line trenches. Such are the men who came out of the war loved and respected by their subordinates, their comrades.

There may be no question about the Management working, but the worker wants to see him occasionally. The fact that he is laboring behind closed doors in an attractive office is not enough to inspire the average worker with the "cause" of the business. And he not only wants to see him but to feel wholly free to speak with him. Any executive who is too old fashioned, dull or obtuse to recognize this and feels that he is lowering his dignity by mingling with his employes is unwittingly working to destroy the "cause" of his business.

Now for the executive under you. How many leaders have you, Mr. Employer, in your business? Think them over carefully. How many real executives have you by whom you would care to have the non-executive pattern? How much good work are you doing toward the solution of employer-employe relations which is being constantly undone by your executives?

You can spend all the energy and time you like discussing ideals of the business with the rank and file, but is it not so much wasted energy if you have not first sold those ideals to the executives who are the immediate example of that rank and file? Miss Brown says, "Why should I be so careful to come in on time when my superior is late every other day and nothing is said just because he happens to be an executive?" And Miss Brown is right. The Management does not say anything to her "boss," because that particular individual may be doing a creditable piece of work in his present position. In fact, that executive may be doing immeasurable harm. Is he not sowing the seeds of discontent, or something worse by just his example? He is daily drawing the line between non-executive and executive, between class and privilege.

What has been already said as to respect for the owner of the business is equally true as to the executives under that head. Why does the average executive feel that he must "blow somebody up," who is in a subordinate position because of the "call down" he himself got from someone higher up? And what redress has the non-executive for such a "call down," and what has become of the "cause" of the business, of the owner's ideals in the mind of that non-executive? Of what use is it for the Management to expend their energies trying to awaken the rank and file to a realization of their responsibilities when that same rank and file have every day before their eyes examples in their immediate superiors to quite the contrary?

If the Management would give sufficient thought to educating the executive to the ideals of the business, the rank and file would be no problem, for unconsciously perhaps, but nevertheless to a large degree, do they not follow the examples of the executive to whom they are responsible, and with whom they come in constant contact?

Now, for a moment let us consider the successful small store. Here we have no personnel managers, no hospitals no employe restaurants, and

SKF



Deep-Groove Ball Bearings

Take Propeller Thrust at 248½ Miles Per Hour

THE hitherto unattained speed of 248½ miles per hour was achieved by Lieut. R. L. Maughan on October 17th with an Army-Curtiss Racer, equipped with a Curtiss D-12 engine developing 460 H. P.

The force developed through the 7½ ft. propeller, turning at 2,300 R. P. M. with a peripheral speed of over 10 miles per minute, was communicated to the plane through a single deep-groove radial ball bearing, 5.9 by 1.1 inches in overall dimensions, made by the Hess-Bright Manufacturing Company.

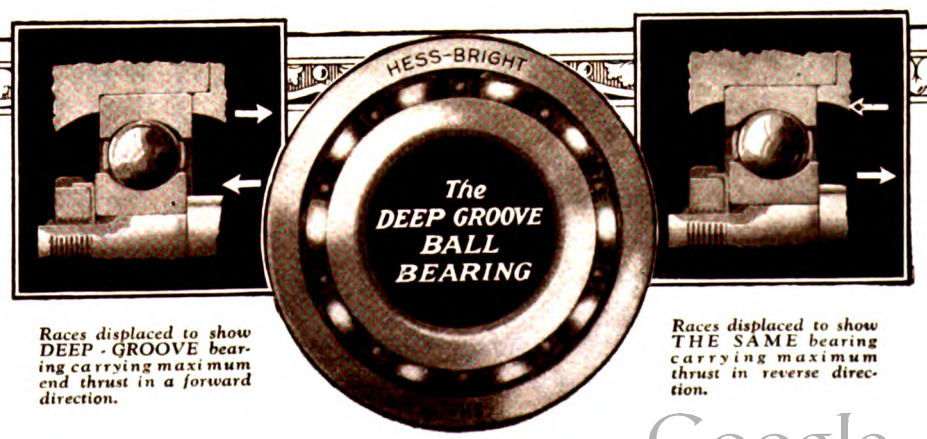
A similar bearing took the propeller thrust on the Curtiss Army Racer with which Lieut. Maughan won the Pulitzer Speed Trophy, on October 14th, for a distance of 250 kilometers—average speed 205.8 miles per hour.

The Curtiss company were pioneers in the use of deep-groove ball bearings to take propeller thrust and the latest performances merely confirm the dependability and stamina of this type of bearing under unusual service conditions.

THE HESS-BRIGHT MANUFACTURING COMPANY

Supervised by SKF INDUSTRIES, INC., 165 Broadway, New York City

887



Races displaced to show DEEP-GROOVE bearing carrying maximum end thrust in a forward direction.

Races displaced to show THE SAME bearing carrying maximum thrust in reverse direction.

BALL BEARINGS

The Highest Expression of the Bearing Principle

Digitized by Google



Unload a Car For 3 Dollars

THAT'S real economy.

That's what Scoop Conveyor users are doing.

That's what you should be doing.

Are you going to keep on giving away 12 or 15 dollars with every car you unload or are you going to catch on and direct this 12 or 15 dollars into the proper channels?

With a Scoop Conveyor cars can be unloaded at any point along the track without a pit or track hopper. The scoop end of the machine is placed next the rail underneath the car hopper, the hopper is dropped and the conveyor carries the material away as fast as it flows through. No laborious and expensive hand shovelling.

Under average conditions a fifty ton car is unloaded in from 1½ to 3 hours.

Thousands of users are saving time, trouble and a lot of expense by use of this equipment. The machines are also used for loading trucks, storing, reclaiming and transferring all kinds of loose materials.

Write for Catalogue No. 158

Portable Machinery Co.

PASSAIC, N. J.

ask any user

THE SCOOP CONVEYOR

yet if it is basically right to have such things at all, one would think they were just as important for the small store as for the large, providing the small store is to grow and is called upon when small to compete for its labor against concerns which have these things.

But the answer lies in the fact that the small store actually has these very things under a different name like, let us say, the salesman's padded expense account. The manager or owner is one and all in himself. He knows all his people by name; further, he knows something about them individually, and what is more important, they know him. They know when business is good and when it is bad. They know when the boss is not feeling well; they divine when domestic troubles have upset him; and in some respects they know even more about him than he does of himself. Consequently, he still remains a man,—something of flesh and blood like themselves. If they want a raise or a day off, or are in sudden trouble, the owner is the one they speak to, not some employment manager who, in all likelihood, will never be an owner himself. The cause of the business is a real, intimate, tangible cause. They know when they ask for an increase whether or not, in most instances, the business will warrant it. But the business grows and the owner finds it necessary to employ an assistant. Immediately your cause is one step removed until the manager or owner lands on a floor many feet above the street, behind closed doors in a luxurious office into which "rush fools where angels fear to tread."

What has become of your cause? Is it to be supposed that the line of executives, through which this cause has to pass to reach the rank and file, will all interpret the ideals of the Management as you wish them interpreted? By the time your cause reaches its destination, it is a weak, sorry little thing, indeed.

And who's to blame? The rank and file,—the Management or the executives? The closer you get to the top of any business the more real the cause of the business becomes. This is well exemplified in the work and function of the private secretary. She still stands in the same relationship to the owner of the business as does the shop girl in the small store.

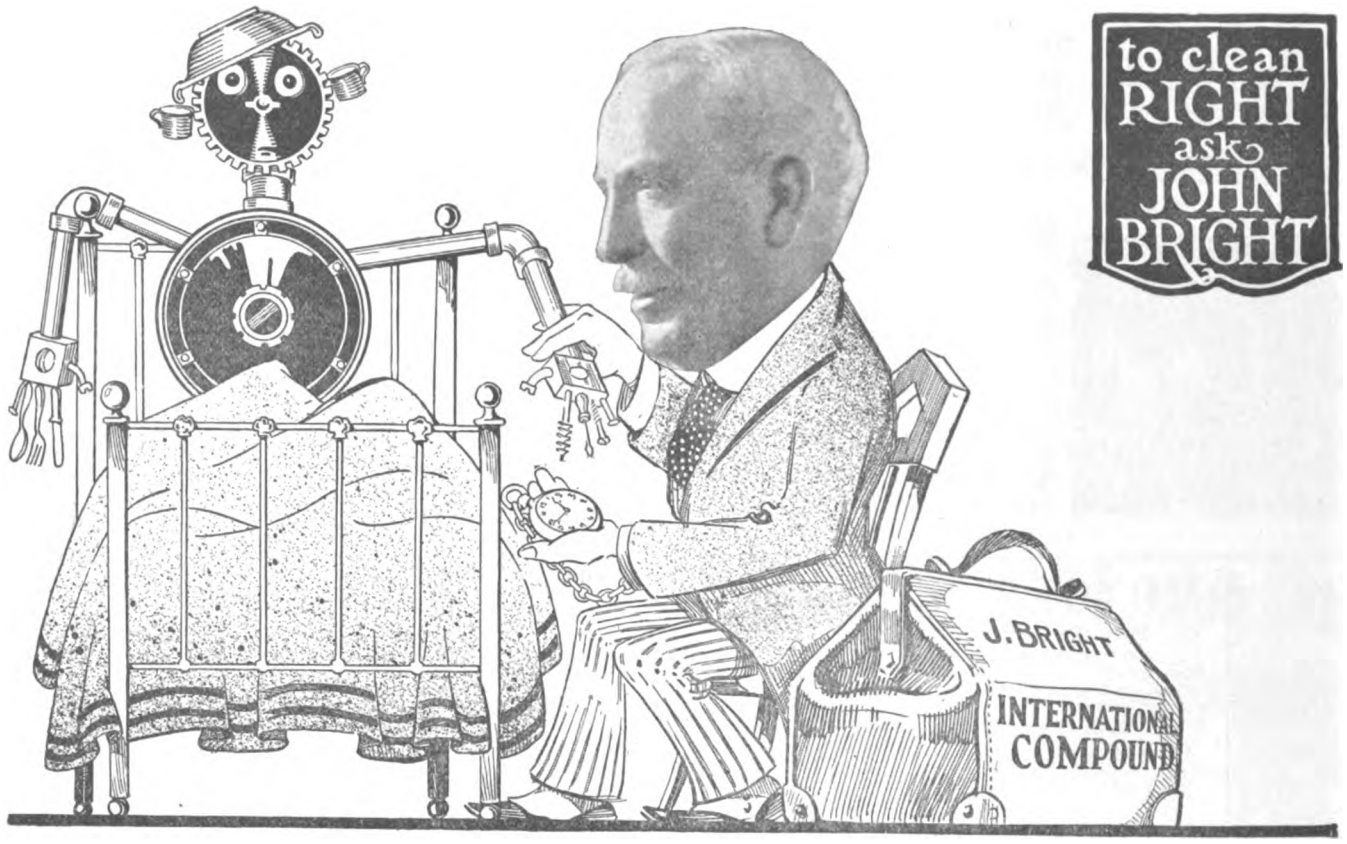
The real "cause" of the business, of course, is first found among those most vitally interested in the future of that business, those who will eventually get the most out of it, naturally. This intangible factor is still largely manifest in the group that stands next to the Manager, the Assistant Managers, who have a right,—or think they have,—to the ultimate inheritance of the business. Then, as we go down the line, this cause becomes weaker and weaker just as the hope of ever being a manager becomes more of a barren ambition than a living possibility.

Now change the word "cause" to "ideals,"—the "cause" of your business, the "ideals" of your business, *your ideals*. Are you, yourself, sold to those ideals? If you are, your next job is to sell them to the executives who are to come after you. The manager with the true ideals, with a loyal line of officers enthusiastically back of those ideals—providing, of course, the ideals are right—need never worry about employer-employe problems, nor in the final analysis, about his business making money, his deserving and attaining an enduring and an honorable name.

The closer the mutual interests of workers and employers, the more obvious the fact to the humblest employe that energy, sustained and unfaltering, intelligent service and zeal, are appreciated by men of largeness of heart and understanding, and will continuue to be appreciated tomorrow, next week, next month and next year. Thus, the more solidified their loyalty, the surer the lasting success of the business. No one now seriously questions that. In American business life that assertion may be accepted as a truism. Proofs of it abound in every American city. This, then being, as we often hear, the land of opportunity for all, no man, woman or child with a new idea, or in lieu of that, a resolute determination to do at all times his or her "level best," need here wait long for recognization and reward. Let that

(*Continued on Page 70*)

Digitized by Google



Introducing JOHN BRIGHT, D. C.—*At your Service*

I SUPPOSE you are all curious to know what the "D. C." stands for, eh? It is Doctor of Cleaning and my twenty years' experience in solving cleaning problems and perfecting scientific compounds has so fitted me to cure cleaning ills that people have given me the title.

Yes, I realize this sounds mighty egotistical, but you see I have finally persuaded the advertising men to let me talk "straight from the shoulder" to people interested in industrial cleaning. So I am talking frankly in an effort to give you facts.

For years I have been successfully treating the cleaning troubles of metal goods concerns, railroads, automobile manufacturers, dairies, textile mills and many others. My company manufactures more than forty cleaning compounds, one of which will suit your individual needs. And it's part of my job to tell you which one to use, after you tell me what your trouble is.

You don't have to juggle around with one or two cleaners trying to make them clean everything. That's wasteful and unnecessary.

If you will write me in detail about your cleaning operations, I will send you enough of the proper cleaner to thoroughly convince you that INTERNATIONAL CLEANERS will do better work at less cost than the cleaner you are now using. If my cleaner does not do this, return what is left after you have tried it, and you won't owe me a cent. That's my proposition. Fair enough, isn't it?

Internationally yours
John Bright

International Products
IC
International Chemical Co.

INTERNATIONAL CHEMICAL CO.

PHILADELPHIA ~~~~~ PENNA.

Digitized by Google

MATERIAL



ELECTRIC TRACTORS

Transport Tons

where hand trucks move pounds. They reduce expense in all your departments.

Request Catalog 1208.

The Elwell-Parker Electric Company

Cleveland, Ohio



MOTORBLOC

The Motor Driven Chain Hoist

The MOTORBLOC is hung up like any chain hoist. When connected to the nearest circuit, it is ready for work without any Engineering Preliminaries.

Light—Portable—Steel-Strong

"Hook Up, Plug In, Let's Go." Write for full details

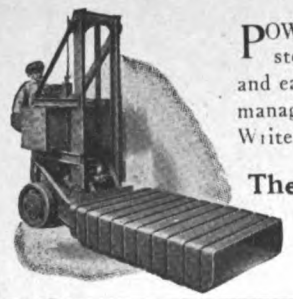


MOTORBLOC CORPORATION

Summerdale PHILADELPHIA

POWELL Pressed Steel Platforms

Adapted to all Hand and Electric Lift Trucks



POWERFUL Lift Truck Platforms of one-piece, seamless steel construction that last a lifetime. They create speed and ease in handling loads. Workmen like to use them and managers appreciate their long life and low cost. Write for prices.

The Powell Pressed Steel Co.

Hubbard, Ohio.

Suburb of Youngstown, Ohio

For lower handling costs—

Northwest Cranes—with clamshell bucket or grappling hooks; as a pile driver.

Northwest Draglines—for drainage jobs, excavating, grading.

Northwest Shovels—with only one motor—gas or electric.

A complete line proved in service. Patented crawler base provides

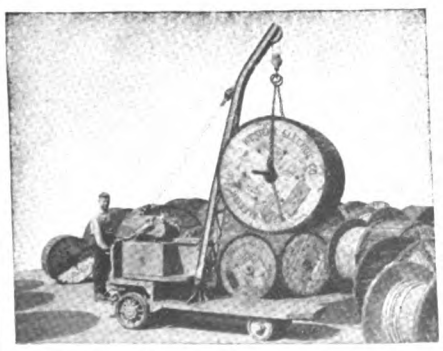
Unequalled Mobility

NORTHWEST ENGINEERING CO., Chicago



The Northwest Crane, shown below, cuts handling costs in a thousand and one operations. Write—

Northwest Crawler Cranes—Draglines—Shovels



Easiest Way to Handle 3,000 Pound Pieces

is on Electric Industrial Trucks equipped with **REVOLVING CRANES.**

Bulletin 51 tells how.

The Elwell-Parker Electric Company

Cleveland Ohio

HANDLING

(*Continued from Page 68*)

seed be implanted as a conviction in the breast of the worker.

Faith goes with good works along all lines of labor in this open, free Democracy of ours. Enthusiasm and intelligence go hand in hand toward great material as well as spiritual ends. In these surging, thronging cities energy begets energy and unselfish examples always tend to become contagious. It spurs on, stimulates and inspires hope and ambition. So as our Cambridge poet says: "Let us, then, be up and doing, With a heart for any fate,— Still achieving, still pursuing, Learn to labor and to wait."

Handling 3000 Tons of Mail a Day

(*Continued from Page 21*)

end of the line, thus effecting a saving of close to an hour on each motor truck load.

The first step in the system begins at the large business houses or mail order concerns. The mail is loaded into six or eight of the small tilting trucks and the latter are conveyed by a large motor truck to the mail terminal building. Arrived there, the tilting trucks are pulled out of the motor truck, coupled together in trains and attached to an electric tractor, which hauls them to a trough or pit, 50 feet long and 45 inches wide, in the floor. Immediately below is a 42-inch, 4-ply feed belt. A bumper at one side of the pit marks the route for the train of tilting trucks and prevents it from slipping into the pit. As the train passes along, employes tilt each truck and the contents slide to the feed belt below. The belt is traveling in the opposite direction from that of the train, and thus it clears each truck load in time to receive the next load.

Conveyor No. 1, (shown at the right in Fig. 1.) is approximately 100 feet long, while conveyor No. 11, (shown at the left in the same illustration) is 50 feet long. These conveyors travel 40 feet per minute and carry all the pre-canceled mail going through the building. The width of the belt is 42 inches and it has a carrying capacity of 15 pounds per square foot. This would amount to approximately 25,000 pounds, or 12½ tons, per hour. These two conveyors deliver to inclined conveyors numbered 1 A and 11 A (see Fig. 3) which run up to the second and third floors, respectively, and terminate in what is called the Primary [illegible]eparation Unit No. 1 on the [illegible]rd floor. From the second [illegible] mail is delivered onto a 44-inch incline belt which, in turn, deposits it on the third floor. This belt acts as feed belt for Primary Separation Unit No. 2, which adjoins Unit No. 1, there being a common tier between them.

The separation unit on the third floor, which is 130 feet long, takes care of the mail for the states of Iowa, Indiana, Michigan, Wisconsin, Illinois, and Ohio. The sorting clerks stand on a platform extending between the two tiers of belt conveyors (there being three feet of space each for forty men), pick from the feed belt the packages intended for the different states, and throw them onto the various belts specified for those states. Canvas flares at the sides of the belts prevent packages from going onto the floor, at the same time deflecting packages to belts and breaking their fall. A separation unit on the fourth floor takes care of the belts assigned to the states of Missouri, New York, Kentucky, etc. The primary separation system on this floor has the same number of belts as the system on the third floor, the only difference being that the fourth-floor system is 60 feet long whereas the third-floor system is 130 feet in length.

The final separation and classification of all mail handled by the terminal forces is made at tables on the second, third, fourth and fifth floors where the mail is placed in sacks and properly marked ready for delivery to the Union station forces on the track floor or the basement, or to the street vehicles on the street floor for delivery to various parts of the city or to other railway stations. Such mail, in sacks, is handled by means of tractor trains which take the sacks direct to mail cars.

Digitized by Google

The movement of the sacked mail from the floors mentioned to the track or street floors is accomplished by carrying the sacks, on balanced type trucks, to holes in the floor leading to longitudinal ceiling conveyors directly below these floors. There are twenty of these ceiling conveyors in all, five to a floor, which extend practically the entire length of the building. The mail is dropped onto the ceiling conveyors through openings, or chutes, in the floors. There are 60 of these chutes, 24 to 30 inches in size, to a floor and they are uniformly spaced apart. Since it is not desirable to have the mail sacks drop the full vertical distance of 7 feet from the floor level to the ceiling conveyors, the chutes are each given a quarter turn, an arrangement which permits the sacks to slide within three feet of the belts. Each of the twenty ceiling conveyor belts is also connected with one of five double spiral chutes placed in different parts of the building. These chutes are made of No. 12 gauge steel plates with double blades. Three of them extend to the basement, while the other two are provided with delivery spouts on the street floor.

The belting forming the conveyors is made of four thicknesses of canvas, weighing two pounds to the square yard. In splicing the belts flexible metal lacing is used. The ends of the belts are pulled together by means of clamps and the teeth meshed together with a strip of metal inserted to keep them from pulling apart. The belts travel on rollers of cold drawn seamless steel tubes which range from 3½ to 5 inches in diameter. This tubing is spot-welded to port turned steel shafts ¾ pressed steel heads that sup- inches in diameter. The shafts are fitted with renewable steel races and there are two roller bearings to each roller. This method of installation has been estimated to save some $15,000 a year in power costs, over plain bearings.

Operation of the belts is by means of motor-driven double-drive pulleys, the main pulley being 30 inches in diameter and provided with an automatic gravity takeup. The 71 separate conveyor belts are driven by an equal number of motors. Every motor has a control, there being six control boards in all, or 2 to each of three floors. There are lock buttons at every motor, and every 100 feet there are start and stop push bottons. The latter feature is provided in order to prevent the piling up of mail should a section of the train of conveying equipment in advance be shut off. The cost of this system of belt-conveyor transportation alone was half a million dollars.

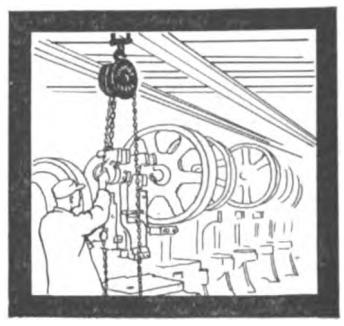
It is the belief of Postal authorities that aircraft will soon occupy as important a place in the transmission of mail as railroads and motor trucks. With this idea in mind, provision has been made by which the roof of the new mail terminal building can be converted into a landing and starting place for airplanes and possibly even dirigibles. A number of foreign governments interested in the possibilities of aerial mail have already requested from the United States full information on this feature of the new station, while others are studying the station as a whole with the idea of installing similar parcel post facilities in their countries.

Underground Coal Storage

STORAGE of coal underground at the mines is suggested by Director H. Foster Bain of the Bureau of mines as a practical step toward the accumulation of those reserves of fuel which are necessary to stabilize industry and to protect the domestic consumer in periods of acute coal shortage, such as the country has recently undergone.

The seasonal demand for coal can to some extent be met by storage, but this must be done by the consumer or by some distributing agent operating between him and the mine, says Dr. Bain in a report made to the United States Coal Commission. At the mines the best place to store coal is in the ground and with unimportant exceptions it is not feasible to provide more than a limited amount of

MATERIAL



Chain Hoists for All Purposes

¼ to 30 Tons Capacity

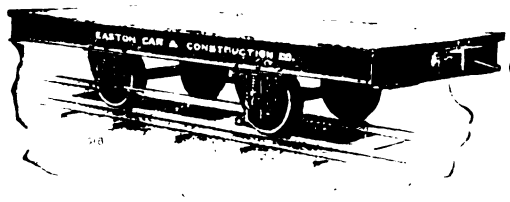
Safe Dependable Economical



WRIGHT MANUFACTURING COMPANY
Lisbon, Ohio

Our catalog will interest you

EASTON CARS



EASTON CARS

COMPLETE INDUSTRIAL RAILWAY EQUIPMENT

2178 E

EASTON CAR AND CONSTRUCTION CO.
Main Office & Works: Easton, Pa. Branches in Principal Cities



Robins Systems
complete with all accessories for the rapid and economical handling of bulk materials.

Write for Handbook of Conveyor Practice

ROBINS CONVEYING BELT COMPANY
New York Chicago Pittsburgh Boston



THROW AWAY YOUR WHEELBARROW and get a

BRADY
STEAM JET ASH CONVEYOR

Save hundreds of dollars. BRADY STEAM JET ASH CONVEYORS are saving money in hundreds of plants. Tell us your problem; send for our "Book of Facts."

We will show you just what we can save you.

THE JAMES A. BRADY FOUNDRY COMPANY
4510 Western Blvd. Chicago, Ill.

Also manufacturers and designers of Pneumatic Conveyors for handling granular and pulverized materials of all kinds.

MATERIALS HANDLING EQUIPMENT THAT CUTS COST TO BEDROCK

HAISS





Portable Belt Conveyors—Truck Loaders
Catalog on Request
THE GEO. HAISS MANUFACTURING CO., Inc.
146th St. & Canal Place, New York

HANDLING

Digitized by Google

MATERIAL



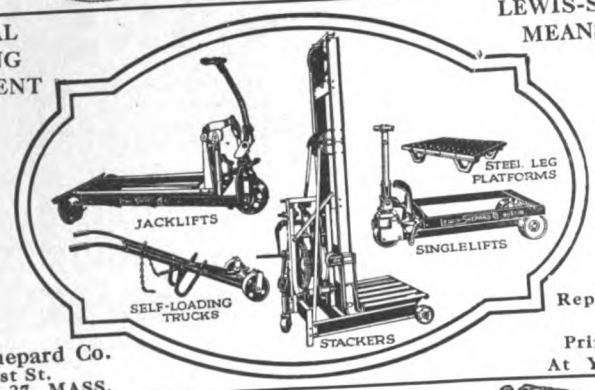
AMERICAN INDUSTRIAL
Frictionless
DOUBLE BALL and ROLLER BEARING CASTERS

The American Caster swivels on balls, rides on balls and rolls on rollers.
ABSOLUTELY WILL NOT drag sidewise. Rigid casters to match.

If you are not getting satisfactory service from the casters you use on your industrial trucks or product,
Try the AMERICAN.
PHILIP A. HELLER & SONS
213 West State Street
Detroit, Mich.

MATERIAL HANDLING EQUIPMENT

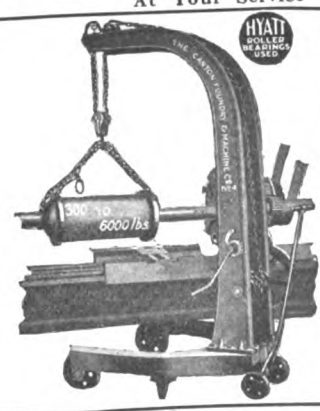
LEWIS-SHEPARD MEANS LABOR SAVING



Made by
Lewis-Shepard Co.
582 E. First St.
BOSTON 27, MASS.

Representatives in the Principal Cities At Your Service

CANTON
Portable Floor CRANE



Makes One Man's Time Worth Six

Truly "The Handiest Tool in the Shop." Goes where nothing else can reach. The CANTON will lower your lifting costs. *Send for catalog* F 15

CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
Permanent Exhibit Salesroom, Grand Central Palace, New York

"*Handling*" is the wrong word

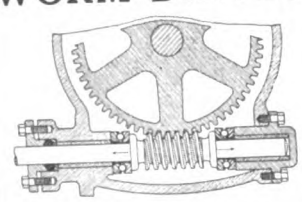


when applied to Dow Conveyors. *Handling* suggests *carrying by hand* whereas the very purpose of Dow Conveyors is to dispense with costly human effort in moving parts and finished products from one place to another. Dow Conveyors (Gravity and Power) do away with porters and enable the skilled mechanic to devote *all* of his time to production instead of intermittently walking the floor. Many manufacturers are not aware of the time-labor-and money-saving ability of Dow Conveyors. The facts are yours for the asking. The Dow Co., Incorporated, Louisville, Ky.

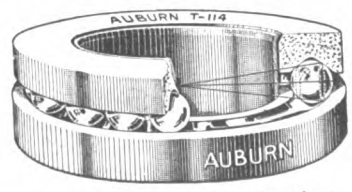


DOW CONVEYORS

WORM DRIVES OPERATE MORE SMOOTHLY WITH AUBURN THRUSTS



Trade Mark



Reduce back lash, increase the life of both Worm and Gear, and get smoother operation by using AUBURN BALL THRUST BEARINGS. Tell us your problem and get the Auburn Answer. Ask for Catalogue.
STEEL BRASS AND BRONZE BALLS
AUBURN BALL BEARING COMPANY
20 INDUSTRIAL STREET ROCHESTER, N. Y., U. S. A.

HANDLING

storage above ground.

The anthracite companies established near points of consumption a system of great storage piles which were valuable balance wheels to the trade and have facilitated that steadiness of operation which distinguishes anthracite from bituminous mining. Large scale storage of bituminous coal has been less practical because the uncertainty as to future price—a result of the excess capacity of the mines and the keen competition—has deterred companies and individuals from making the necessary investment. The same factors tend to discourage individual consumers from storing in summer, coal that will not be burned till winter. In periods of advancing price or of anticipated shortage, however, as much as 60,000,000 tons of bituminous coal has actually gone into storage. This is enough under normal conditions to stabilize the industry and also to contradict effectually those who doubt the technical feasibility of storing soft coal.

With proper selection of the coal and due attention to modest requirements as to methods, it is entirely practicable to store large quantities of most coal at moderate cost, continues Dr. Bain. The risk is in the uncertainties as to future price, as the mine and railway equipment of the country is extensive enough to allow industry, except under unusal conditions, to obtain adequate supplies direct from the mines. Coal shortage and car shortage is a local matter in normal years. The nation has put men and money into coal mining and the railways to meet peak loads rather than provide a less amount of capital for coal storage and so insure steady and economical operation. The whole problem of coal storage has recently been reviewed by H. H. Stoek, consulting engineer to the Bureau of Mines, and a report is being prepared which will place the facts at the disposal of all persons interested.

The possibility of devising a use classification that will permit a wider pooling of coal is also suggested by Dr. Bain. "Such pooling would relieve the pressure on docks, terminals, and railway equipment," he declares. Most users of coal lack facilities for selecting the grades best suited to their needs, and most coal is sold on its name or on the reputation of the operating company or local dealer. A good name is a valuable asset in business and when one has been built up it should be preserved as a public benefit, but this should not be incompatible with the perfecting of some system whereby a buyer could be assumed of getting on delivery a definite measure of predetermined value in his coal. A system that would justly penalize dirty coal and would assure each grade selling on its merit would be in the public interest. If such variable products as cotton, potatoes, and wheat can be satisfactorily graded for delivery in the public markets it would seem not too much to ask that a similar system be applied to coal. A basic difficulty is that of sampling and measuring without undue expense a commodity handled in such quantity. It is much more difficult to sample coal by hundreds of trainloads than to grade potatoes by the box or even the carload. In coal, too, there is the fundamental difficulty of the wide range in sizes as compared with grains of wheat or corn. Provisional systems have been worked out and are being regularly applied by the Bureau of Mines in supervising purchases of coal for the Federal fuel yard in Washington, the Isthmian Canal Commission, and other Government establishments. Much time and thought have been devoted to the subject and further studies are under way. The general desirability of simplifying the marketing and transportation of coal, and of establishing grades responsive to use, with further provision of effective and not too expensive methods of testing the coal flowing in commerce, is undoubted, and it is to this end that the Bureau of Mines is working.

"In the long run it is believed that as technical and economic conditions in the industry progressively improve, the social and labor conditions will largely care for themselves."

Digitized by Google

From U. S. Bureau of Mines.

Washington, D. C.—Gasoline production in the United State attained a near-record in October, the month's output of 566,278,689 gallons having been exceeded only by the figures for last July, when but 3,400,00 gallons more were refined, states the Bureau of Mines. The October production represents an increase of about 30,000,000 gallons over the September output, and is 28 per cent greater than the gasoline production for October, 1921. Domestic consumption of gasoline decreased about 18,000,000 gallons from the September consumption figure, but was about 7.5 per cent above the figure for October of last year. Exports and shipments to insular possessions amounted to approximately 43,000,000 gallons. Stocks of gasoline on hand November 1 were 723,584,062 gallons, an increase of 33, 500,000 gallons during the month.

The number of refineries reporting to the Bureau of Mines during October was 310, with a total indicated daily capacity of 1,844,540 barrels. These refineries were operated at 86 per cent of their capacity.

Production of kerosene in October amounted to 215,203,459 gallons, an increase of 8.72 per cent over September. Exports and shipments of kerosene to insular possessions amounted to 84,331,437 gallons, an increase of 16.94 per cent, which largely accounts for a decrease of stocks amounting to 5.29 per cent. Stocks on hand November 1 were 256,259,432 gallons.

Total production of gas and fuel oils reported to the Bureau of Mines during October was about 4,000,000 gallons above the September figure, and amounted to 921,606,114 gallons. Stocks of these oils on hand November 1, were 1,368,748,880 gallons, an increase of 4,000,000 gallons. Both the output and stocks of gas and fuel oils for October, 1922 were 10.54 per cent above the figures for October, 1921. Exports and shipments to insular possessions during October amounted to 63,315,723 gallons. Bunker oil laden on vessels engaged in foreign trade amounted to 114,100,728 gallons.

The Ironworkers

They call me an Alpine climber, but I *build my* peaks to the sky,
I am really a two-legged spider, spinning my web on high.
Short time have I to drink the colors that bubble in the wells of morn,
But I have seen dawn's trembling rose, and its clustered violets born.

Below me pigmies in the street pursue their crawling way,
Their feet must hug the solid earth, while I with danger play.
I know the whistle of the roystering wind, and thrill to its reckless voice,
For I am a daring chit of the air—I climb, and my feet rejoice.

I manage the upper rungs with ease, and sway like a weather-vane,
I bump my head up against the clouds, as smart as an areoplane.

There are sightless flies in the mines of coal that are born of the germs of gloom,
But I am bred of the sun-washed roofs, and I sometimes drop to doom.

Before me curves the world of work,—a crowded canvas spread,
Each rivet hammered home with air to me means daily bread.
In cold or heat my muscles dance from a wine of courage strong—
An eagle thrives beyond the clouds, and I trail the eagle's song.

And whether the age sweeps on to dust, or points to the nearest star,
My horn's unslung from the naked heights, where the fearless seekers are.
For men are stirred with the urge of wings—they build, they climb, they fly,
And I take clean pride in spinning my web between the earth and sky.

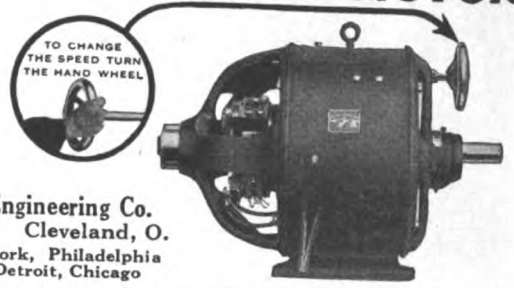
J. Corson Miller...

POWER

THESE motors will provide your machines with operating speeds to suit all kinds of jobs. They run at any speed over ranges up to 1 to 10. There is no power lost as speed is varied.

Get bulletin 1014 for details

Type A.S. Adjustable Speed RELIANCE MOTORS



Reliance Electric & Engineering Co.
1045 Ivanhoe Road Cleveland, O.
Branches: Boston, New York, Philadelphia Pittsburgh, Cincinnati. Detroit, Chicago



LOWER FUEL BILLS ARE EASILY OBTAINABLE

The Hays Automatic CO_2 and Draft Recorder writes the complete story of furnace conditions. With reliable, up-to-the-minute information as a guide it is easy to get the utmost out of your expensive fuel.

Handsome savings are being made in thousands of Hays equipped plants. It will pay you liberally to tell us about your equipment and fuel and let us make recommendations. No obligation.

The Jos. W. Hays Corporation
Combustion Efficiency Appliances



"The Fireman's Bible," sixteenth edition. Many illustrations. A laugh on every page. $1.00 per copy, post paid.

"CALOREX" Burners

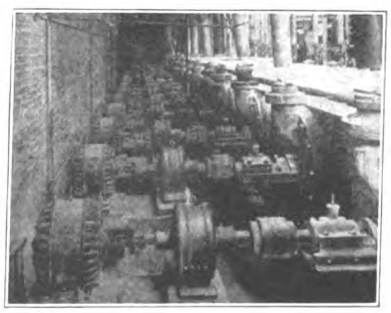


MOUNTED FOR BOILER

Using STEAM or AIR for Atomizing

33 years experience manufacturing liquid fuel equipment. Cheapest to operate—Simple in construction. *No parts to wear out*—Will last a life time. Burns FUEL OIL, CRUDE OIL or TAR. Write for catalog

W. N. BEST FURNACE & BURNER COMPANY
11 Broadway ENGINEERS IN CALORIC NEW YORK



Battery of James Spur Gear Speed Reducing Transmissions doing continuous heavy duty without interruption.

D. O. JAMES Manufacturing Co.
1114 W. Monroe St., Chicago, Ill.

—a big subject
—a book that covers it thoroughly

THE scenes shift almost overnight: Yesterday furnace building was forgotten in the clamor for greater combustion rates; today hundreds of plants are realizing that combustion rates have found their limit in the staying power of refractories that once were considered "good enough."

How to build a furnace that will stand the gaff of modern firing methods is the subject of the hour:

—And it is the subject of this new book—just off the press. Its fifty pages are devoted to every angle of the furnace problem; why furnaces fail; how to build furnaces that will not fail.



50 pages of furnace facts— FREE

The book is free. Write for it, to—
JOINTLESS FIRE BRICK CO., 1154 Clay Street, Chicago

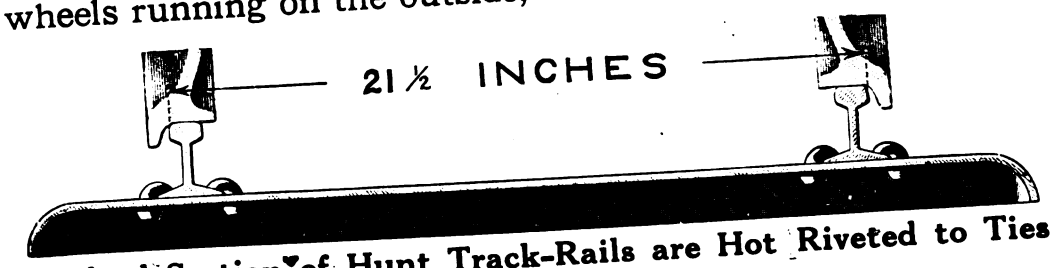
EQUIPMENT

Digitized by Google

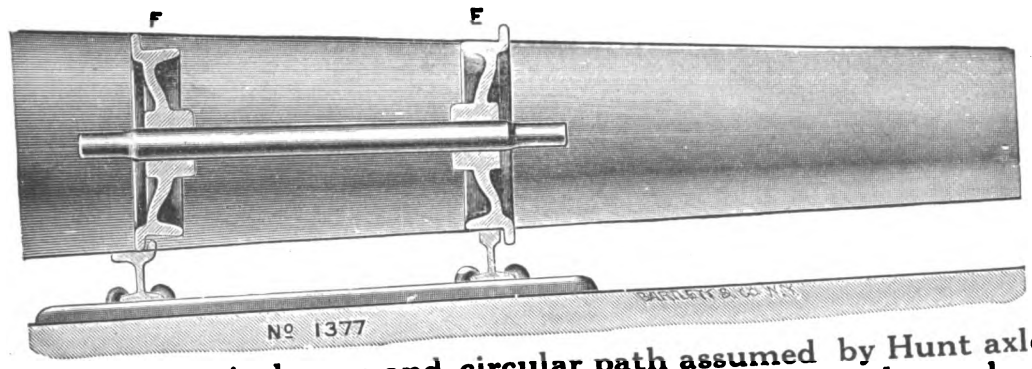
HUNT INDUSTRIAL TRACK and EQUIPMENT

is constructed for every industry and service where the movement of material is essential. ***One man*** can push a ***one ton load*** on a ***Hunt System*** around 12-ft. Radius Curves and Switches as Easily as on Straight Track. The ***secret*** of this Easy Running is in the Construction of the Running Gear, Curves and Switches.

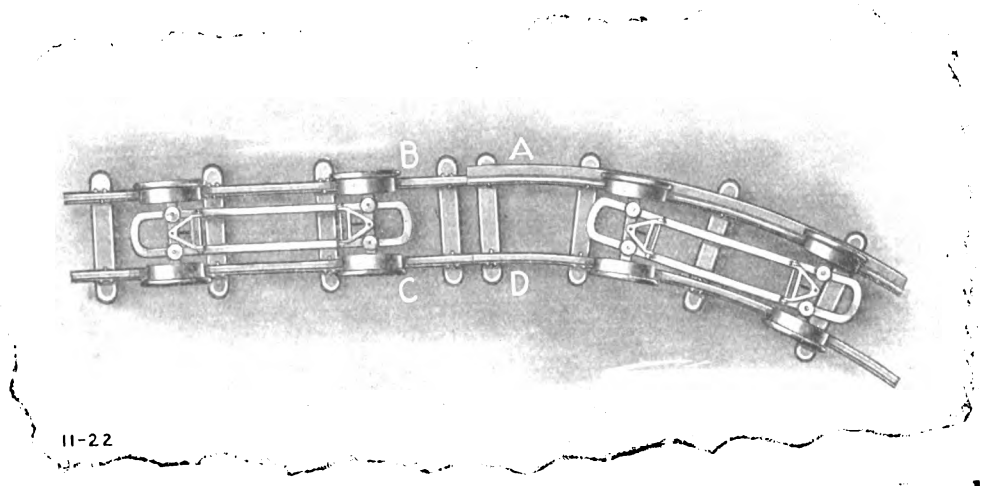
The Gauge of track is 21½ inches, measured from outside to outside of railheads, with the flanges of wheels running on the outside, as illustrated below.



Standard Section of Hunt Track-Rails are Hot Riveted to Ties



Section showing the theoretical cone and circular path assumed by Hunt axle and wheels in rounding a curve. Note that flange of outer wheel rides on special guard rail and tread of inner wheel rides on head of tee rail the same as on straight track, thus forming the cone.



Hunt flexible wheel base showing position of wheels on the straight track and the radial position assumed on the curve

The action of the axles and wheel flanges on Hunt cars in rounding curves is illustrated above. As the car on a straight track approaches the curve, the wheel (B) runs on its flange on the special outer curve rail (A) and the wheel (C) runs on its tread on the inner rail (D). Thus as the axle assumes a radial position there is no slipping on the rails and no sliding friction. Full details will be found in our Industrial Railway Catalogue 22-1. Sent on request.

C. W. HUNT COMPANY, INC.

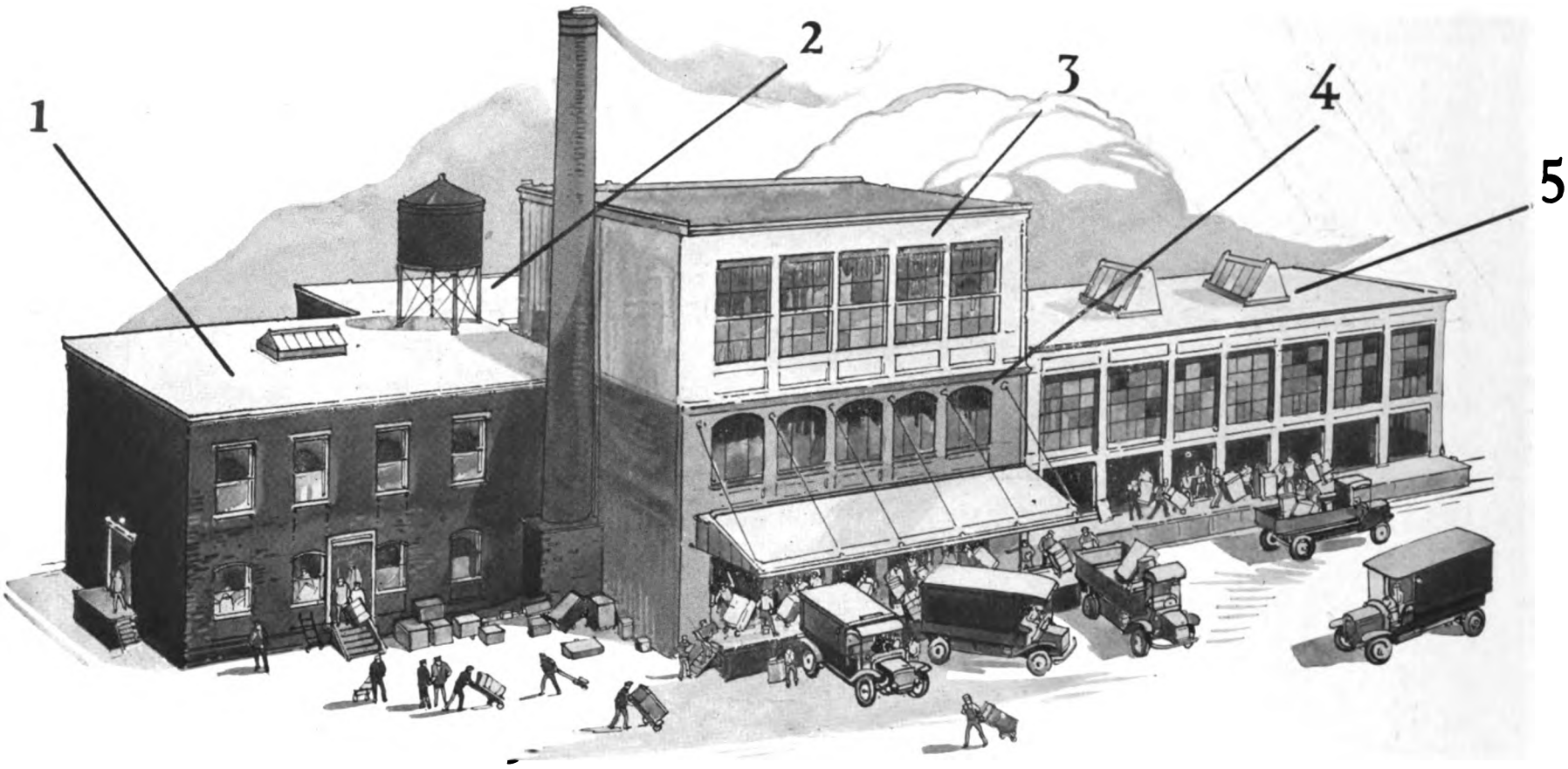
WEST NEW BRIGHTON, NEW YORK

New York Office, 143 Liberty Street

Ernest F. Learned
141 Milk St., Boston 9, Mass.

Phillips, Lang & Co., Inc.
538 So. Dearborn St., Chicago, Ill.

Digitized by Google



There is something wrong with this factory

So much is the matter with this factory that the wrongs are numbered for your convenience in reading

1. The time spent in handling materials and product is too long.
2. Manufacturing processes and operations in additions to the plant are not properly connected with the main building. Materials are not routed in the orderly manner that increases speed and efficiency of production.
3. Materials going from one operation to another are handled several times before reaching their destination. Delay due to handling and rehandling has its effect all along the line to the shipping-room door, where shipments are slower than they should be.
4. Working space is cluttered up with trucks and with materials which should be in work.
5. Stocks of half-finished work are dangerously large because of slow handling. They represent tied-up capital, which should be invested in productive work.

THIS factory is in a bad way. It is a wasteful enterprise, producing far less than it should.

Yet a conveying system can make this factory more efficient. It puts handling and carrying on an automatic basis. It does away with trucks and many porters, yet links closely together machines, departments, floors, and buildings. It moves materials and half-finished work in a regular, steady stream along the proper route from receiving-room to shipping-room. Aisles are clear and floor space is released for more machines.

Talk it over with a Lamson engineer

The Lamson organization has had long experience in dealing with handling problems in practically every industry. Our engineers are therefore well fitted to tell you whether a conveying system will increase your production and lower your costs.

If your factory is suffering from any of these "wrongs," have a Lamson engineer come from our nearest branch and see whether he can help you correct them. Should Lamson Conveyors be indicated, they can be installed unit by unit, each new section beginning to pay for itself as soon as you begin to use it. And after installation, we will show you how to get the most efficient service from every unit and the entire system.

THE LAMSON COMPANY
SYRACUSE, NEW YORK
Branches in Principal Cities

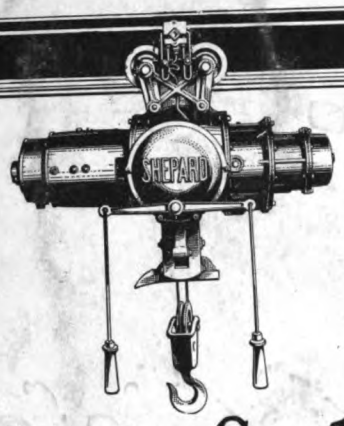
LAMSON SERVICE

Lamson Conveying Systems

Digitized by Google

THE SHEPARD ELECTRIC LIFT ABOUT

A new and smaller Electric Hoist



A remedy for labor shortage not found in "help wanted" columns



HELP WANTED—MALE.

HANDYMAN for general factory work and packing; call at once. P—— Machine Co., 1221 38th st., Brooklyn.

HELPERS, experienced, handling furniture. C—— Warehouses, 426 W. 26th, 112 W.

IRONWORKER'S HELPERS. Apply M—— Co., 93 13th, Brooklyn.

LABORERS (25), 9 hours' work, good job, nearby. Apply ready to ship. S——, 49 E. 19th st.

LABORERS; STEADY WORK, DAY AND NIGHT SHIFT; call 7 A. M. or between 5.30 and 6 P. M. N—— S—— R—— Co., FRONT ST., LONG ISLAND CITY.

MACHINIST'S HELPER, one who is accu tomed to lathe work. O—— & W— 266 Wallabout st., Brooklyn.

MAN, white, strong, able-bodied, to he

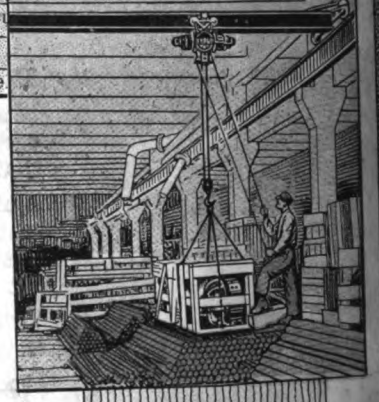
FOR the movement of materials—lifting and load-moving—many hundred business executives are no longer subservient to the "supply and demand" of labor. They have found a permanent remedy in our *LiftAbout*.

When a man installs one of these powerful little electric hoists he gets his load-moving and lifting done at a decidedly lower cost. He brings to this branch of his business, not fluctuation and uncertainty, but permanent "help" that releases two, three, four, maybe a dozen men for other work. And this acquisition costs him no more than he would pay *one* laborer for a few months work.

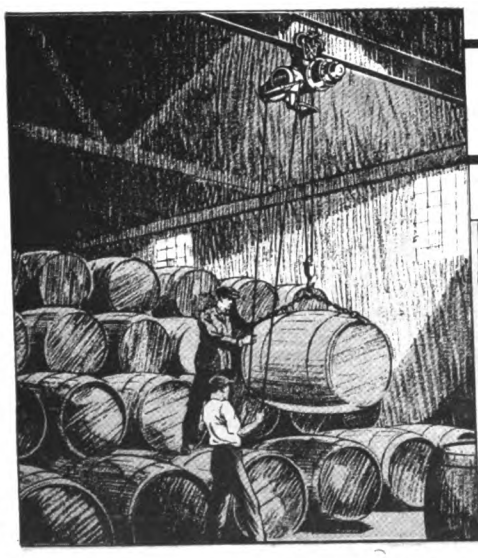
Every *LiftAbout* in service, and it is used in practically every business, is making an actual dollars and cents saving for its owner. This fact, together with the *LiftAbout's* wide application and its low price, really make it a hoist for everybody who has loads to move and lift. It may be *your* hoist—tell us what you handle.

"Shepard" builds electric cranes in capacities to 30 tons, and is the largest producer of electric hoists in America.

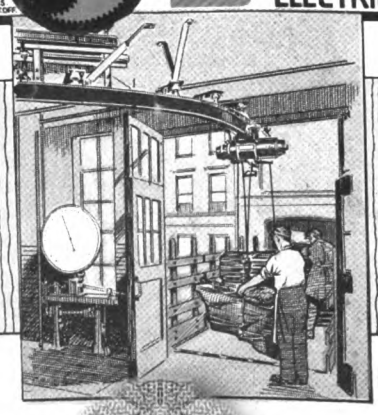
SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave. Montour Falls, N. Y.
Branches in Principal Cities
Member Electric Hoist Mfrs.' Assn.

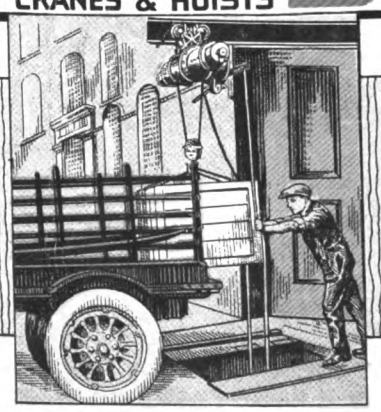


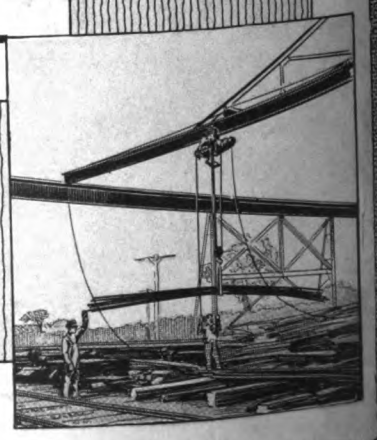




SHEPARD
ELECTRIC CRANES & HOISTS







FEBRUARY 1923

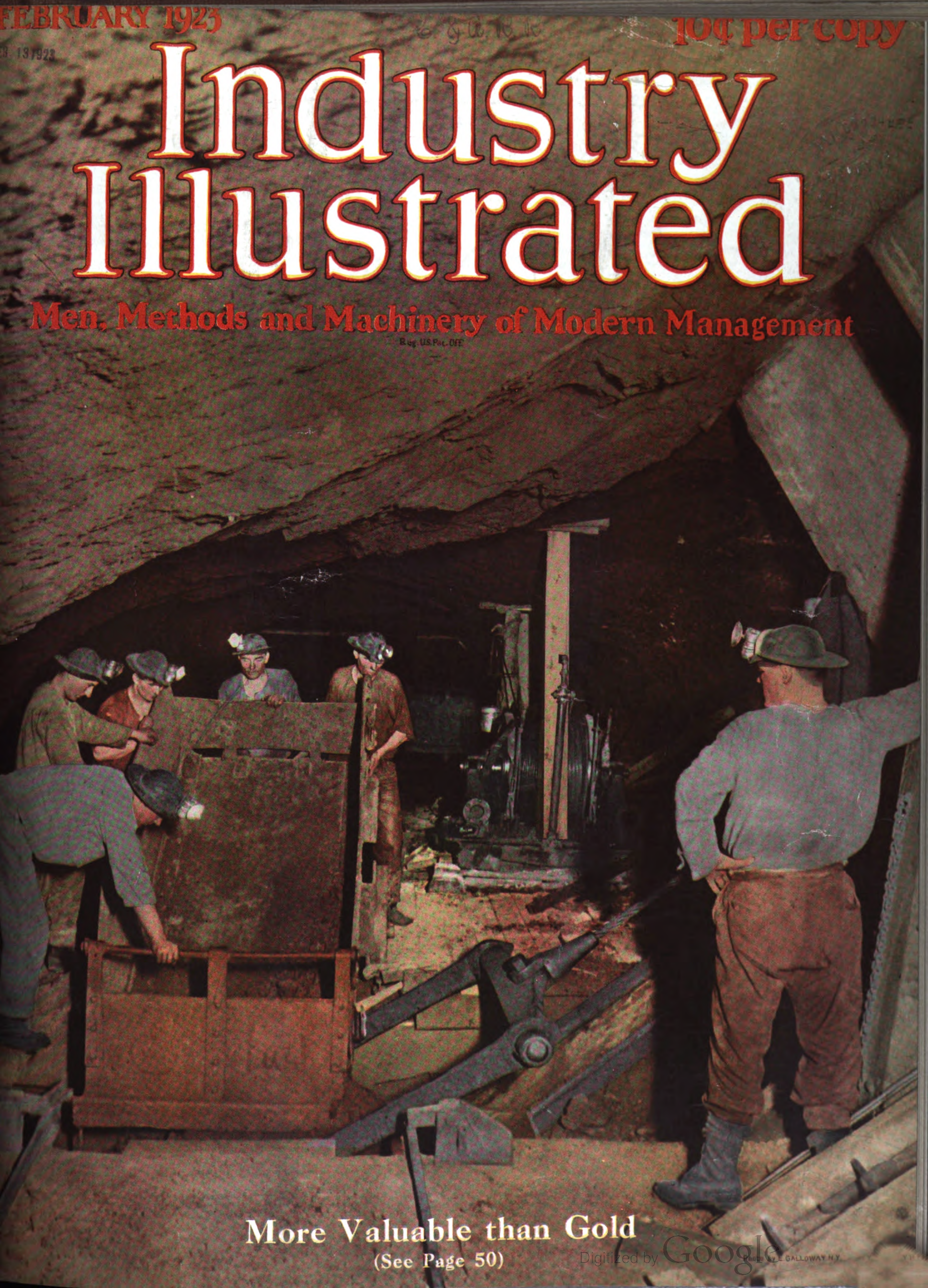
FEB. 13 1923

10¢ per copy

Industry Illustrated

Men, Methods and Machinery of Modern Management

Reg. U.S. Pat. Off.



More Valuable than Gold

(See Page 50)

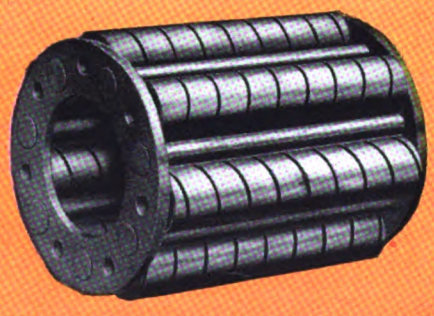
Digitized by Google

Handling Costs Held at a Minimum By Use of Hyatt Bearing Trailers

The New York, New Haven & Hartford Railroad obtains dependable and economical freight handling service at Freight House No. 6 in Boston by the use of Hyatt bearing equipped trailers made by the Lansing Company, Lansing, Mich.



Men responsible for the rapid and economical handling of freight and materials are learning from experience that Hyatt bearing trailers are a real help.



These men are confronted with high wages, scarcity of truckers and heavy maintenance costs. Ordinary trailers tend to make these problems greater because they are hard to push, are frequently in the repair shop, require constant lubrication and soon pound to pieces.

Trailers of the better grade—carefully designed and constructed of superior materials and equipped with Hyatt roller bearings, are easy running, require lubrication only three to four times a year and reduce maintenance costs to a minimum. They make it easy for one man to push the heaviest load, eliminate storage battery strains and are durable and dependable. They give years of money saving, satisfactory service.

It is no longer necessary for you to attempt to make low cost records by using old fashioned plain bearing trailers. Specify Hyatt bearing equipped—it pays.

Hyatt Roller Bearing Company

New York—Worcester—Philadelphia—Pittsburgh
Huntington—Indianapolis—Cleveland—Buffalo
Chicago—Detroit—St. Louis—Milwaukee
San Francisco

Digitized by Google

INDUSTRY ILLUSTRATED

CONTENTS

February, 1923

Editorial—Coal Cost, Plus Page 7

Fitting the Small Steam Turbine into the Factory 8
By John Herbert

Food Distribution as an Industry 12
By M. W. Potts—Routing and Handling of Food Products for the Chain Store

Eliminating the Dust-Explosion Hazard 14
By F. C. Allen, Jr.

Converting the Airplane to Peace-Time Use 16
By D. M. LeBourdais

The Man Who Converted a Bark into a Bite 17
By Ernest H. Rowe—The Career of John M. Browning, Inventor of the Machine Gun

Modern Factory Floors and Their Maintenance 18
By John H. Van Deventer

Transporting Coal from Mine to Waterfront 22
By J. F. Springer

What's in a Name? 24
By Matthew Williams—Widening the Field of the Tiering Machine

New Canadian Power Development at Niagara 26
By James Steelman

For photographs in this issue, not otherwise credited, we are indebted to the Brown Portable Elevator Company, The Economy Engineering Company, New Jersey Foundry and Machine Company, The Revolvater Company, and The B. F. Sturtevant Company.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.

Founded 1891 by

JOHN R. DUNLAP

Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — HARVEY CONOVER, JR., *Vice-President*

JOHN R. DUNLAP, JR. *Secretary-Treasurer*

Vol. 4, No. 2. Subscription price $1.00 per year; single copies 10 cents.

Copyright, 1923, by The Engineering Magazine Co., in both the United States and Great Britain.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

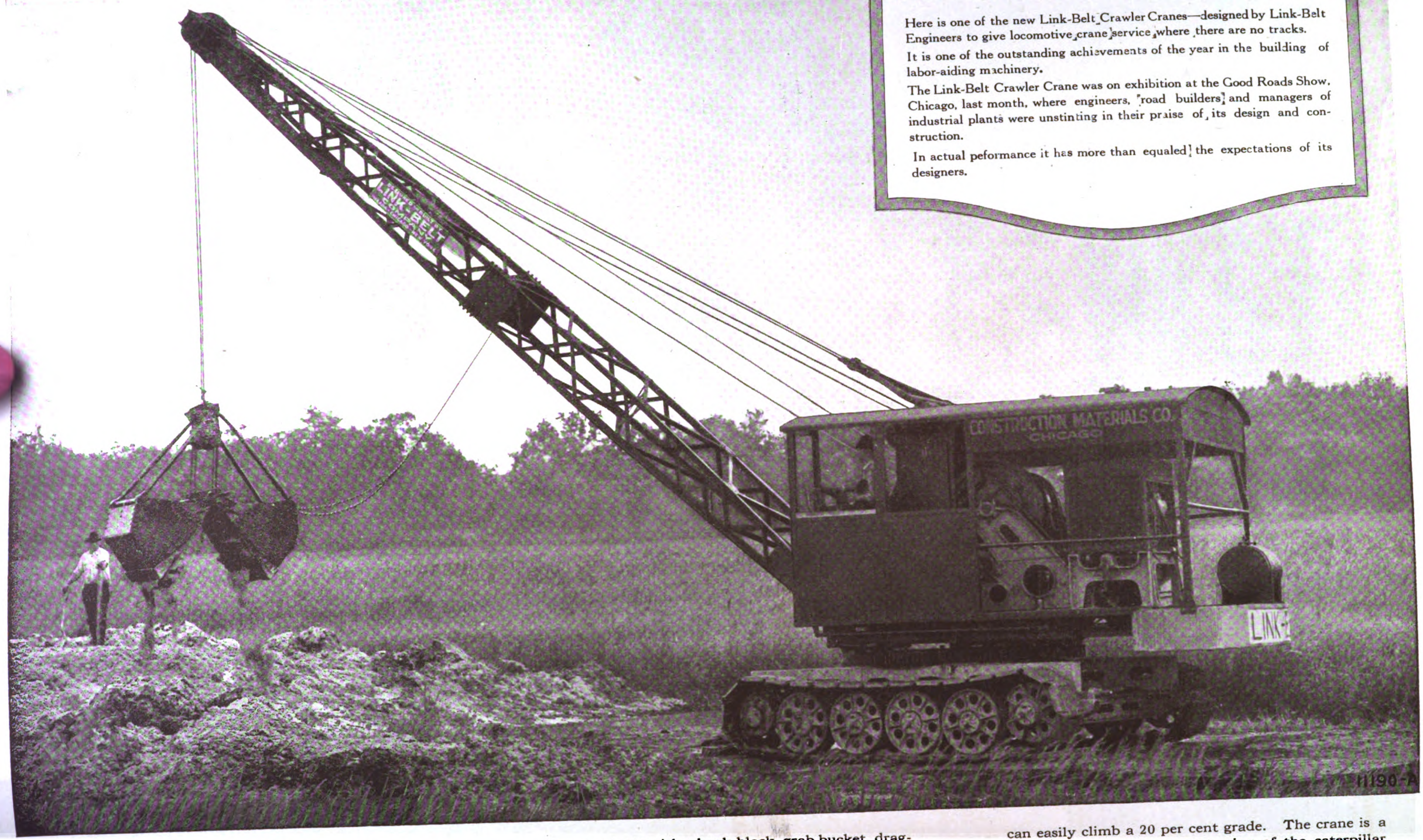
Digitized by Google

Here is one of the new Link-Belt Crawler Cranes—designed by Link-Belt Engineers to give locomotive crane service where there are no tracks.

It is one of the outstanding achievements of the year in the building of labor-aiding machinery.

The Link-Belt Crawler Crane was on exhibition at the Good Roads Show, Chicago, last month, where engineers, road builders and managers of industrial plants were unstinting in their praise of its design and construction.

In actual peformance it has more than equaled the expectations of its designers.



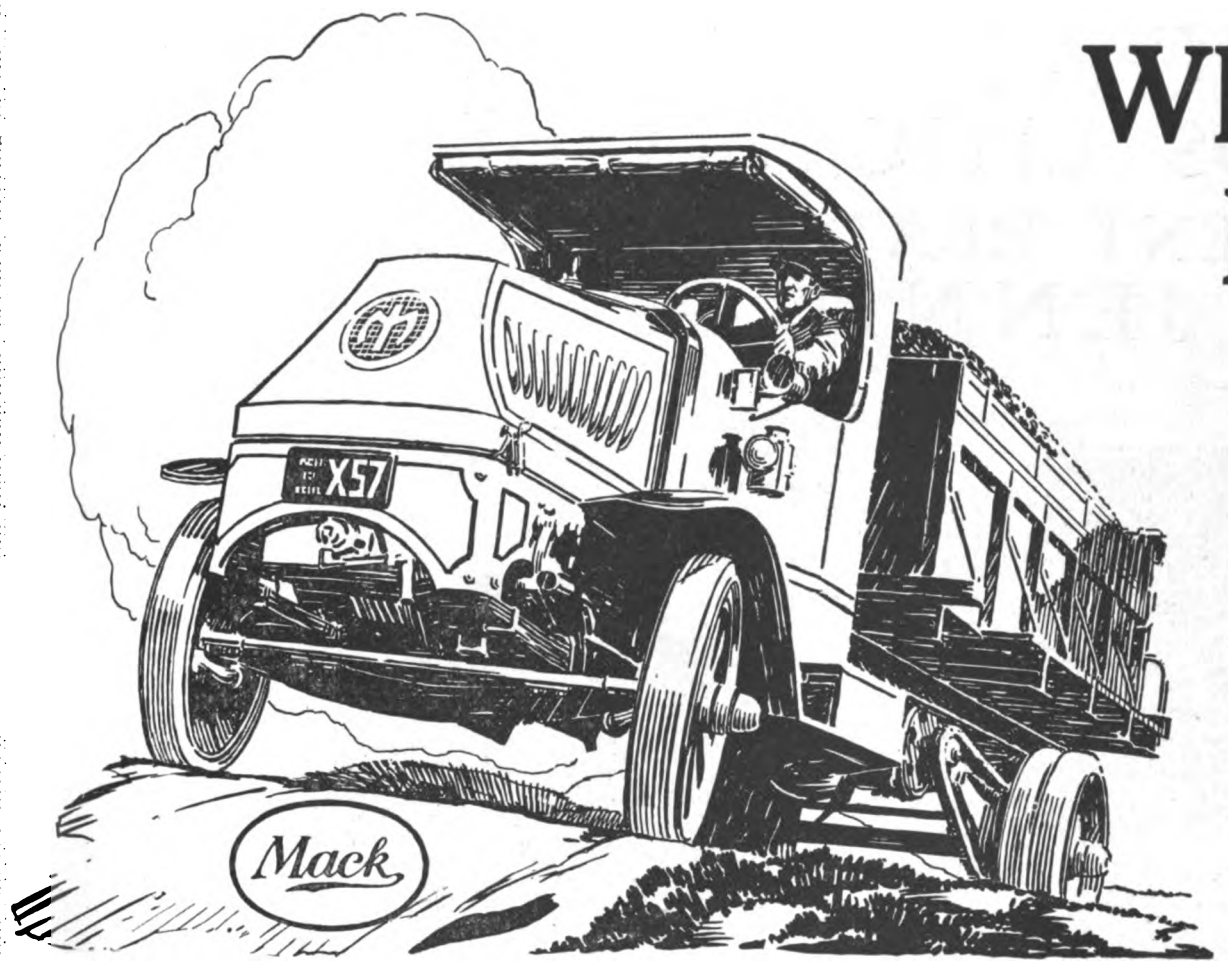
THE new Link-Belt Crawler Crane is built to the high standard of quality characteristic of all Link-Belt products. Its performance astonishes even those accustomed to seeing the best in mechanical achievement.

Rugged, responsive; strong, yet light; an ideal machine for road building, contract work, or for odd jobs around an industrial plant.

It can operate with a hook-block, grab bucket, dragline bucket, skimmer bucket, steam shovel attachment, electric lifting magnet, wood grapple, or pile driver attachment. It weighs 22 tons and can lift 10 tons at 12 ft. radius, or 3 tons at 30 ft. radius. The standard boom is 35 feet long.

The crane rotates four complete revolutions per minute, travels three-quarters of a mile per hour, and can easily climb a 20 per cent grade. The crane is a one-man machine, because steering of the caterpillar truck is controlled in any position of the upper rotating base by a lever at the operator's stand in the cab. Complete specifications, price and delivery upon request to LINK-BELT COMPANY, 300 W. Pershing Road, Chicago.

Digitized by Google



What's Behind It?

The Mack "Bull Dog" which you watch as it passes you on the road, performs faithfully—not only because of the material that goes into it, but because of the brains behind its manufacture.

MORE than one hundred men in the Mack organization are now enrolled with the Industrial Extension Institute, for the Factory Management Course and Service. They have been organized into five groups comprising the "Mack Industrial Extension Club."

THESE groups meet weekly for a discussion of various methods and factors of industrial management which they are covering in their study of the Course. They also discuss the application of these methods and principles to the work in their plant. They know that these methods and principles are sound because they have already been successfully established by the one hundred industrial specialists who prepared the Factory Management Course and Service.

THE suggestions which result from such discussions are passed upon by the Mack Industrial Extension Club as a whole and are then submitted to the management for adoption.

NEEDLESS to say the International Motor Corporation will benefit steadily as a result of the training which these men are receiving, just as many other big industrial organizations have already benefited under similar conditions.

BIG business depends more than ever upon men who are alert and progressive. There is constantly room for improvement in the methods which are used in manufacturing, and big business is usually quick to make a change if it is going to help either in reducing the cost of production or to increase the volume of production.

THE suggestions for improvement must come from the men who are a part of the industrial organization. Therefore it is most important that these men—the department heads, and the key men—have the management viewpoint, rather than merely the departmental viewpoint. If they are trained in the fundamentals of modern industrial management they are able to make intelligent suggestions which frequently cause a substantial increase in profits.

THE Factory Course and service is the only complete training in industrial management which is available. The Institute has co-operated in strengthening many industrial organizations. Why not yours?

THE Institute invites you to write for further information. You will be under no obligation whatsoever, and we believe our plan will interest you very much.

Please address your inquiry to "Department C"

Industrial Extension Institute

9 East 45th St. New York City

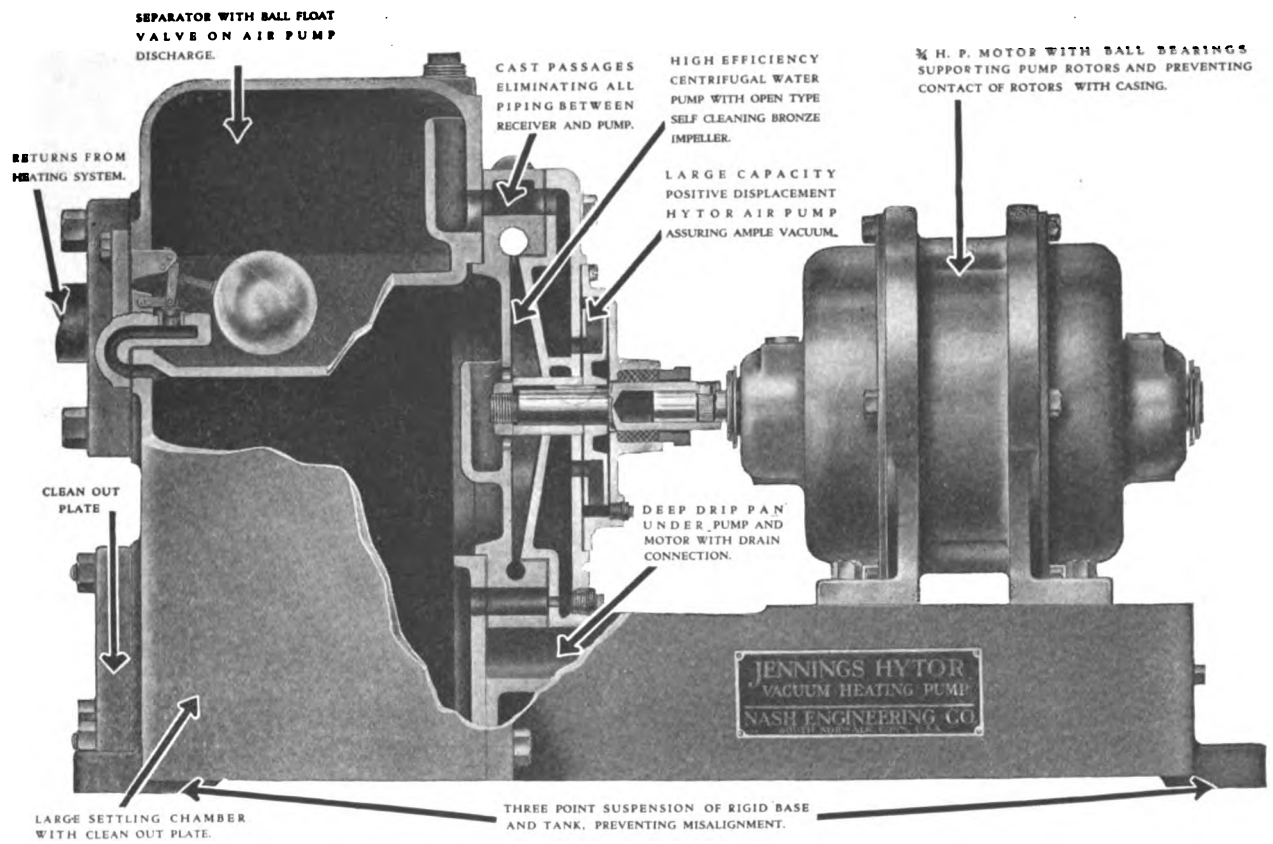
The only Complete Course in Industrial Management

-2-23

Digitized by Google

THE COAL SITUATION DEMANDS EFFICIENT HEATING

EFFICIENT HEATING DEMANDS THE JENNINGS PUMP





This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps
- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps

NAME .....
POSITION .....
COMPANY .....
ADDRESS .....

Now is the time to prepare your heating facilities to meet the conditions of the coming winter.

The installation of a Jennings Return Line Pump in connection with your system means quick heat in the morning, at the most isolated radiators, and in zero weather. It means a positive control of heat at all times and the elimination of radiator noises. It means an economy in fuel, that, according to our customers, makes this piece of equipment a real dividend paying proposition.

Jennings Pumps are made for any size installation. The small unit here illustrated has ample capacity of 5,000 sq. ft. of equivalent direct radiation. Because of simplified design, in connection with quantity production, this outfit is being sold at a price never before possible in a pump of this capacity.

The pump incorporates all of the high grade workmanship and material characteristic of our Jennings equipment. It is equipped with solid bronze air rotor, rotor housing, water impeller and shaft.

In this unit all piping complications have been removed, and it is only necessary to make three connections:
1. The return main. 2. The water discharge. 3. The air discharge.

While the new compact "M" type is furnished in one size, our well known Jennings Pumps in separate tank design, as recommended for larger capacities, are furnished for any size installation.

Many thousands of these pumps have been installed and have given universal satisfaction.

NASH ENGINEERING CO.
SO. NORWALK, CONN. U. S. A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

Coal Cost, Plus

IT has been known, for a number of years, that there were some things wrong with our coal industry; but how many things, and how thoroughly wrong, we are only now beginning to appreciate. The first report of the United States Coal Commission, made public on January 15, in spite of its restrained language, discloses a situation that is a stinging reproach to our much-vaunted American efficiency.

In 1910, the average miner's daily output of bituminous coal was about 3½ tons. In 1921, partly through the increased use of machinery, his daily output was 4 1/5 tons—*an increase of twenty per cent.* Bearing that in mind, it is somewhat startling to learn that in 1910 there were less than 556,000 mine workers, who produced 417 million tons of coal; while in 1921 it required 663,000 mine workers to produce 416 million tons! The explanation for this apparent contradiction lies in the fact that the average bituminous mine worked 217 days in 1910, and only 149 days in 1921.

Naturally enough, it is not the miner's fault that he gets but 149 days' work in a year; nor is it unnatural that he wants his pay to cover a full year's living costs. But it does not by any means follow that the coal consumer should have to pay 300 days' wages for 149 days' production.

When the bubble of post-war inflation collapsed, the collapse hit most industries both suddenly and hard. Skilled labor in specialized lines had to seek employment in alien lines; factories which could not meet the new conditions had to quit; executives who could not produce results had to step down. Recovery, in these industries, has been by the slow, painful but effective process of reducing costs and eliminating wastes.

In the coal industry, however, neither mine workers nor operators have shown any willingness to face the truth. There is admittedly over-expansion in the coal mining industry; we can use the production of but 5,500 of the 8,000 mines in operation; there are some 200,000 too many mine workers in the field. It is this condition that has reduced the average mine working days to 149 out of a reasonable 300 per year.

Is it any greater tragedy for a mine operator to admit his inability to meet competition, close down his mine, and engage in other work, than it is for a manufacturer of clothing or automobiles? If thousands of mechanics, skilled in special trades, were able to readjust themselves to other work, for which a demand existed, cannot the 200,000 excess mine workers do likewise?

There has been much pressure brought to bear on the Administration, to lower the bars on immigration; the argument being that there is a shortage of labor in many industries. Yet, right here in the coal industry is a surplus of some two hundred thousand men for whom, economically speaking, there is no work.

By all means eliminate profiteering, attack the problems of storage and transportation and all the other factors contributing to the unreasonable price of coal. But if we stop there, we merely postpone the inevitable. Coal will never be available at a fair price until it is produced as any other commodity is produced. The coal industry will continue to impose an unjust burden on all industry, and on the nation, just as long as it continues to carry a dead load of fifty per cent. too many mines and fifty per cent. too many workers.

Until that millstone is removed from our necks, we shall continue to pay an excess charge for everything we eat, everything we wear, everything we use; an excess charge for our transportation, heat, light, and power; an excess charge due, not to natural factors, but primarily the result of a vicious combination of inefficiency, selfish greed, and lack of even rudimentary common sense in the mining and distributing of our coal.

Digitized by Google

Fitting the Small Steam Turbine into the Factory

By John Herbert

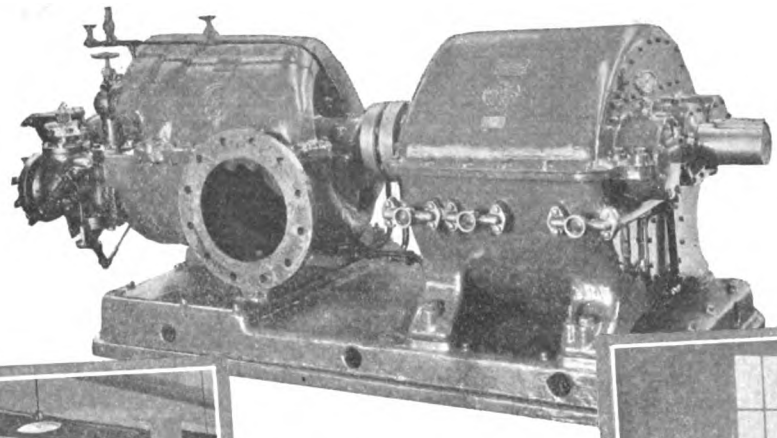
THE modern factory executive in considering the question of power and heat or, going back a step further, the burning of fuel, thinks along quite different lines from those of his predecessor of ten years ago. And he thinks more logically.

But the average man does not begin to think logically nor exhaustively upon an unfamiliar subject until he comes to realize that *not* to do so is costing him money. It is not enough that it *is* costing him money—he must *realize* that it is. To drive home this realization as a rule requires some sort of shock or at least some occurrence or pressure that will force one out of a previously developed mental rut.

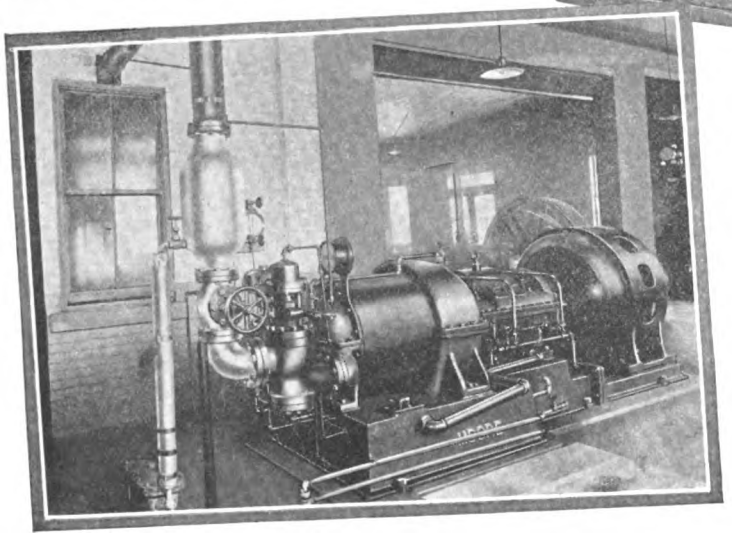
In the case of the factory executive and in connection with the generation of power, this shock or pressure has been applied by the outrageous increase beyond all reason in the price of fuel. The principal fuel for power is coal, and coal, as it happens, is the only commodity that has not receded in price from its war-time peak level. All of the other principal commodities and necessities have come down one hundred or more *points* on the relative price scale, but coal in some mysterious manner seems to be able to resist laws of deflation that have compelled all of these other things to come to more reasonable price levels.

It is for this reason that power costs stick out so prominently in the executive's daily, weekly or monthly cost records that he cannot fail to note them. One of an executive's principal jobs is to scan cost reports and to detect items which show a tendency to grow out of proportion to the growth of the business. So it could not help but happen, with power costs tripled and quadrupled over the pre-war normal, that the factory executive should have his mind forcibly directed toward ways and means of offsetting, if possible, this increased cost.

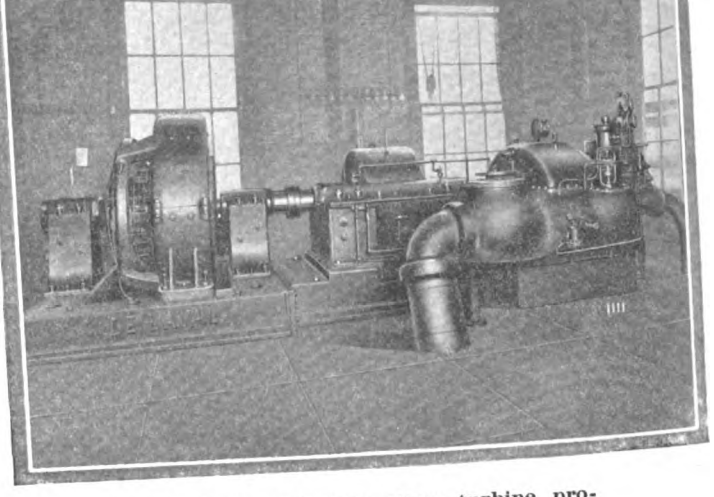
So a good deal of attention has been directed toward the



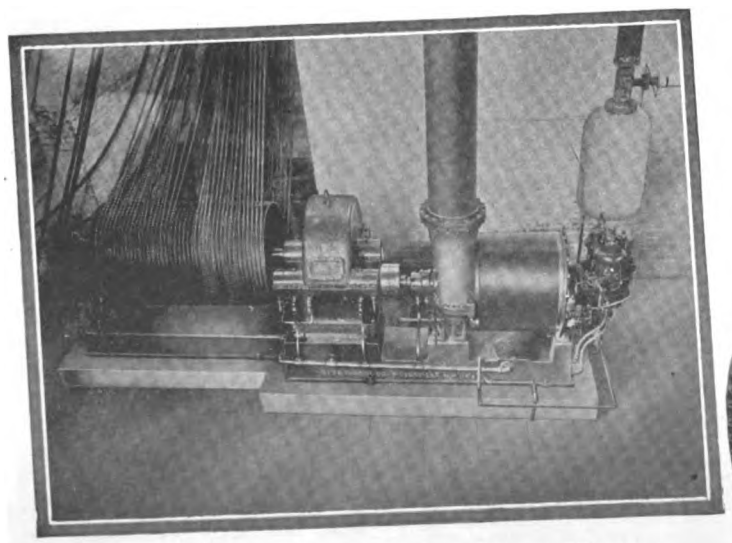
Except for fan and blower service, the usual turbine installation of today includes a reduction gear, thus enabling both turbine and driven apparatus to realize their maximum efficiency.



For the small factory and from the standpoint of simplicity, compactness and reliability, it is hard to beat a turbo-alternator as a primary source of motive power. That shown above is of 320 kw. capacity.

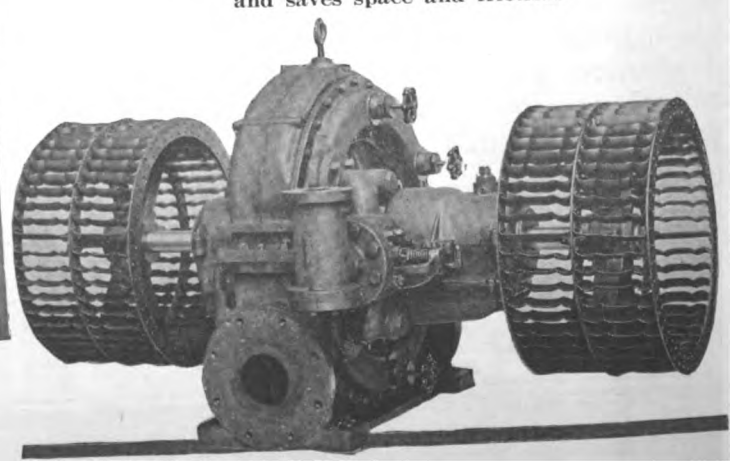


This 500 hp. pressure stage turbine produces power as a by-product of reciprocating engine exhaust, expanding this steam to condenser pressure. **This additional power is obtained practically without cost aside from investment.**

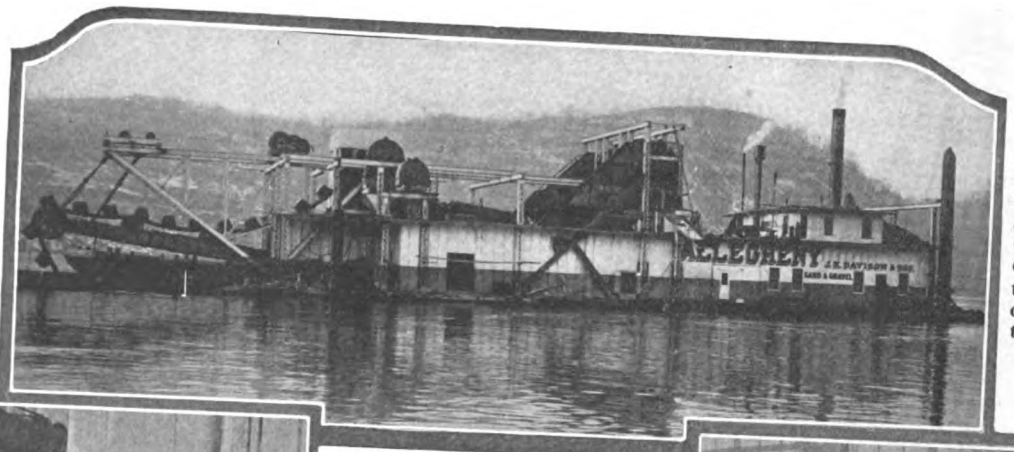


Rope drive is largely used in the southern textile industries and in other places where its qualities are required. One of the oldest forms of drive, it is nevertheless perfectly handled by the modern steam turbine.

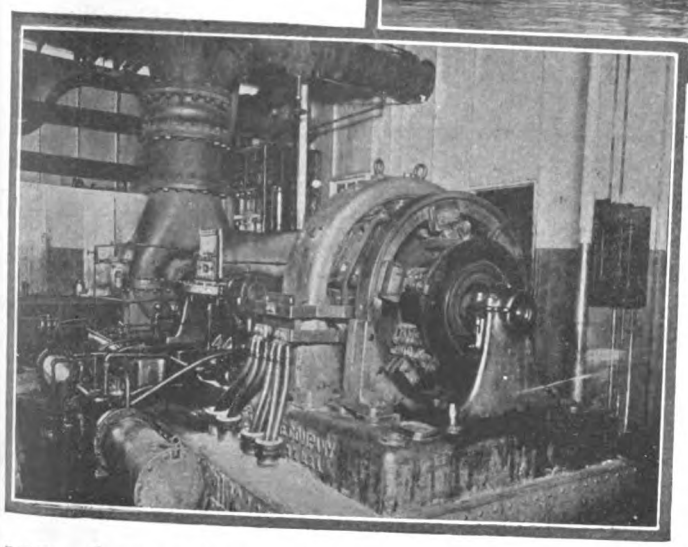
A particularly good arrangement, when it is applicable, is shown above. The direct mounting of the impellers or the turbine shaft avoids the need of fan bearings and saves space and friction.



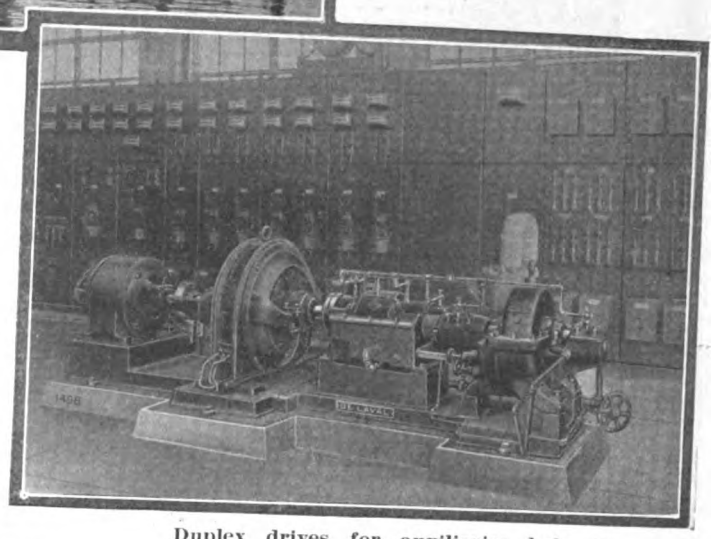
Digitized by Google



Here is a dredging operation that is run on a real factory basis. It is the largest sand dredge on any of the inland waters of the United States. One operator with push button control takes care of dredging and separating 200 tons of sand and 350 tons of gravel per hour.



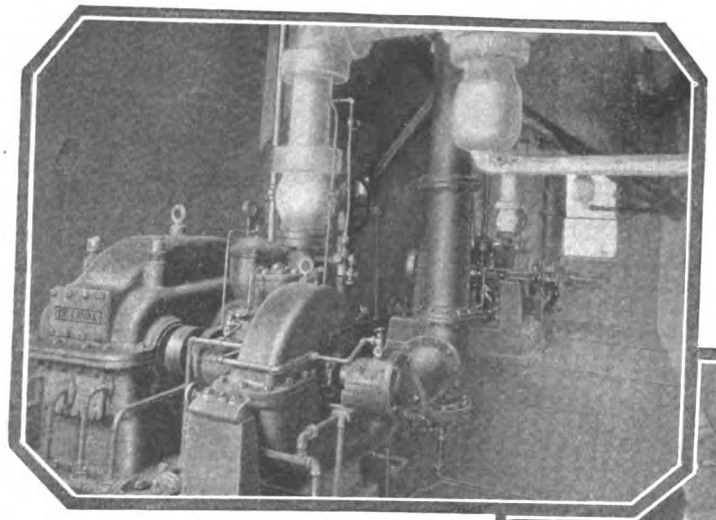
At the left—The power plant of the dredge shown above might well be found in a modern factory. All of the equipment on the dredge is driven by electric motors supplied with power from the 500 kw. turbine generator shown.



Duplex drives for auxiliaries help to regulate the amount of exhaust steam according to feed water requirements. Here a.c. and d.c. generators are coupled to a steam turbine, the d.c. generator being driven either electrically or by steam, as required.

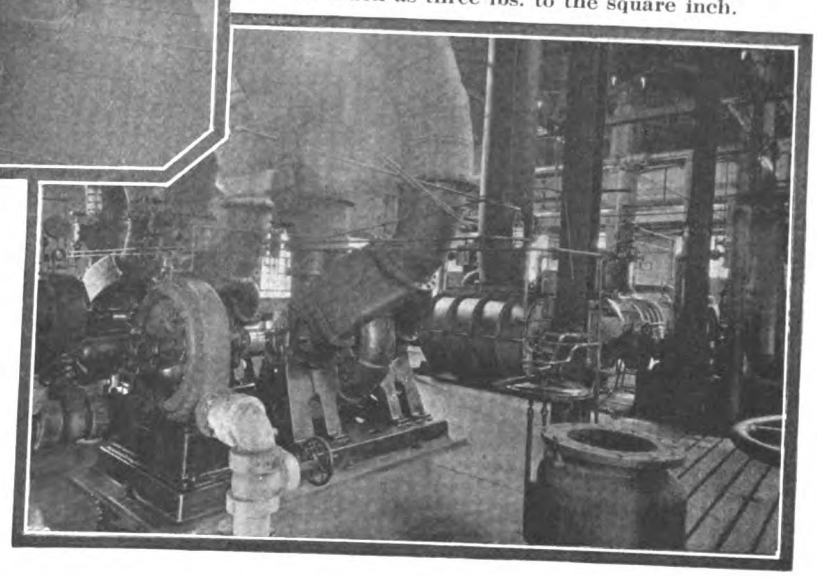
power plant and toward the methods of burning coal (which costs so much money) into power and *heat*. For today in his more logical way of thinking about these things, the executive realizes that power is really a small item in most plants, compared with the heat requirements. In other words the actual efficiency of an engine or turbine is not nearly as important a matter as is the *overall efficiency* in heat distribution. For the average steam engine or turbine takes less than 20 per cent of the heat from the steam produced in our boilers. The remainder gives us the opportunities for cost savings.

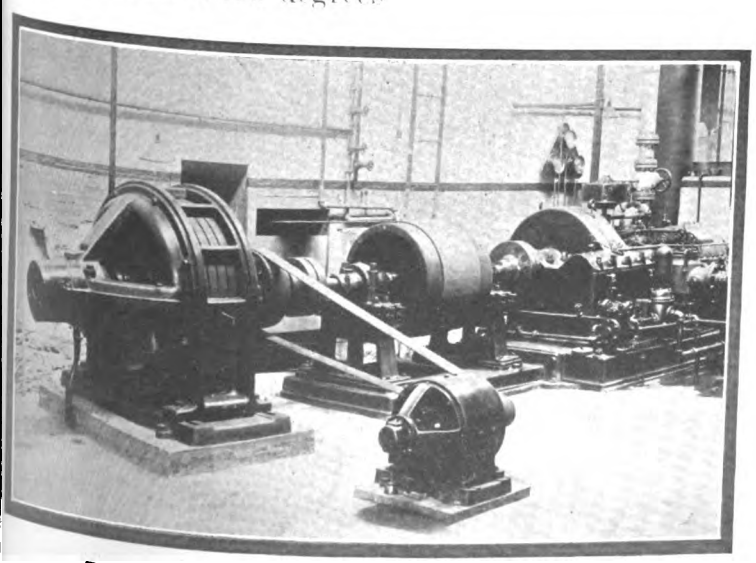
Many an engineer of the old days would spend time and money to secure a few degrees



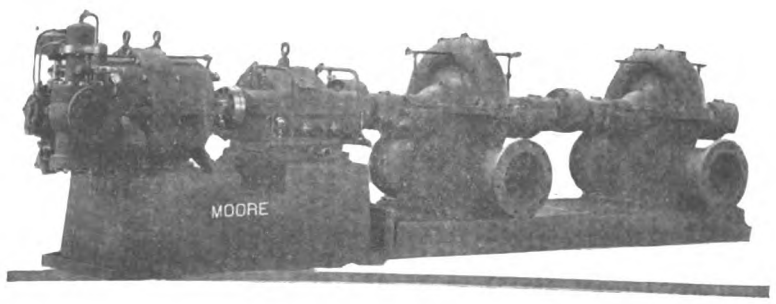
Where explosive dust or gases are likely to be encountered, steam turbines avoid the risk of ignition. Again, in a dust-laden atmosphere, short circuits are produced in armature windings. These trubines, of 300 hp. drive coal crushers at the Everett plant of the New England Fuel and Transportation Company.

Below—Three high pressure forced draft units used in a modern gas plant, are shown here. The pressure is sometimes as much as three lbs. to the square inch.





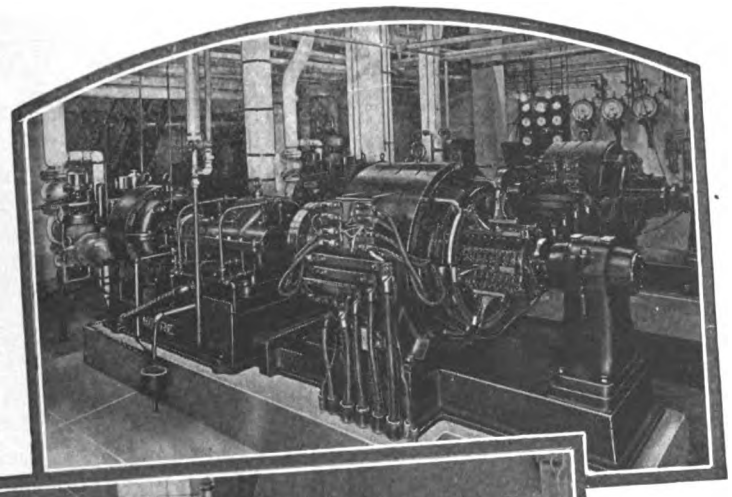
This 300 hp. turbo-generator is delivering power three ways, namely by alternating current and direct current and belt drive. It is designed for "mixed flow" operation and can also be used as an extraction turbine.

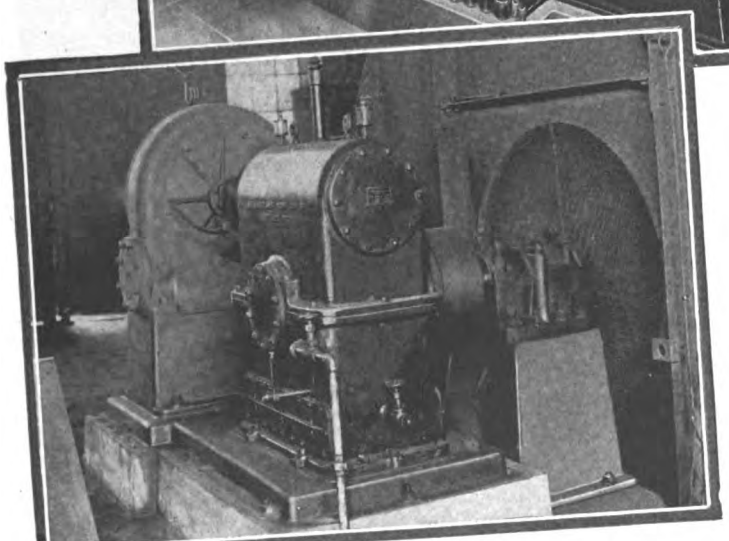


Driving two centrifugal pumps in parallel is a rather unusual duty, but not a difficult one, for a steam turbine. Synchronism in pumps' speeds is positively assured.

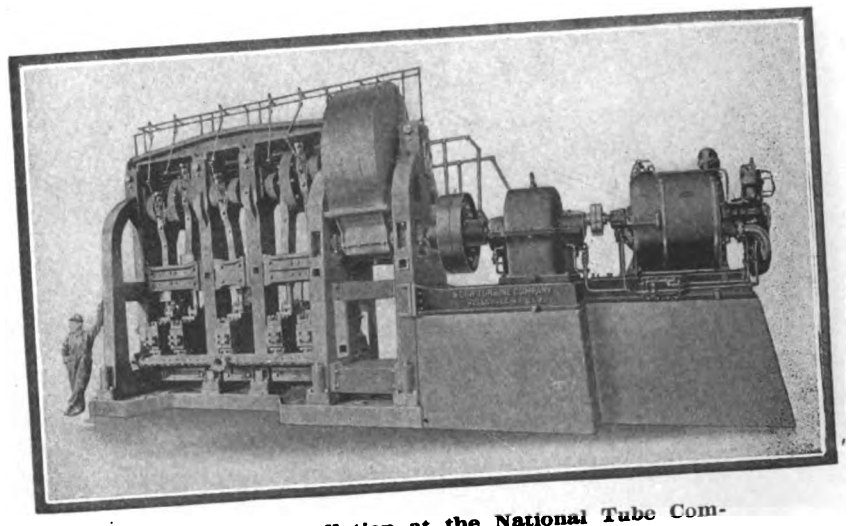
Digitized by Google

Below—That reduction gears can be made to operate noiselessly is evidenced by this installation at the Ritz Carlton Hotel, at Atlantic City. The units are each of 200 kw. capacity.

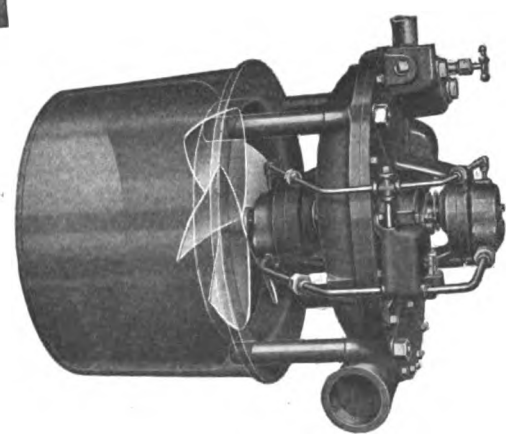




A slow speed fan being driven by a high speed turbine through the medium of a turbo-worm gear.



The above installation at the National Tube Company, Christy Park Works, Pittsburgh, presents an interesting contrast in pressures. The turbine is driven by exhaust steam which enters at two pounds pressure, while the water leaves the pumps at 2000 pounds.

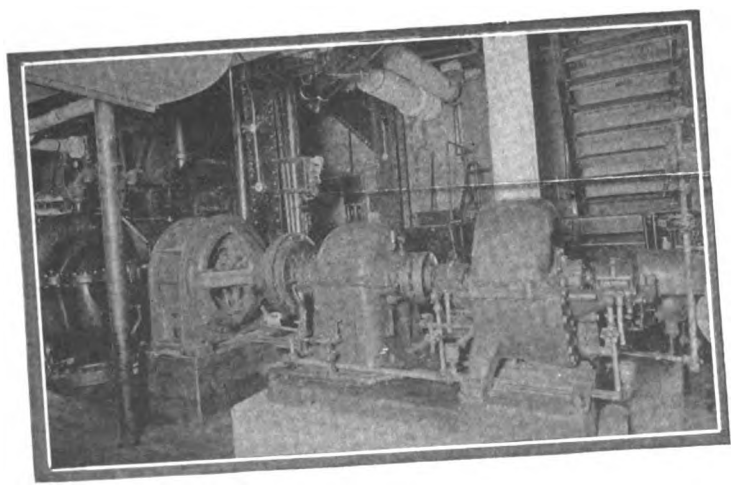


Small turbo-blower units for undergrate forced draft have come into wide general use. These units run at speeds varying from 2500 to 5000 r.p.m. and are throttle controlled.

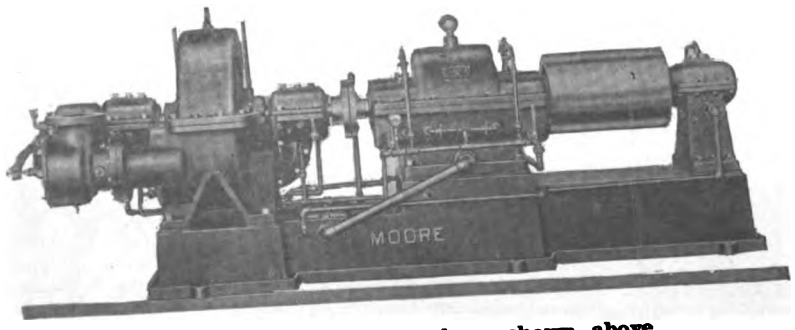
more efficiency from some steam auxiliary in his power plant, while at the same time blowing many times the amount of live steam thus saved into a process or plant heating system. In numerous cases, in fact, power is merely a by-product of the steam required for heating and costs practically nothing, aside from the investment in the prime mover.

A very clear statement of this often overlooked fact was made by Egbert Douglas in a recent article entitled "Facts About Coal Conservation," published in Industrial Management in November, 1922.

"In the metallurgical industries a large percentage of the fuel is used for melting metal



At the left another illustration of the modern tendency toward duplex drive for auxiliary units is reproduced from the plant of the Long Island Lighting Company at Northport, L. I. Here the circulating pump is optionally driven by the turbine or the induction motor.

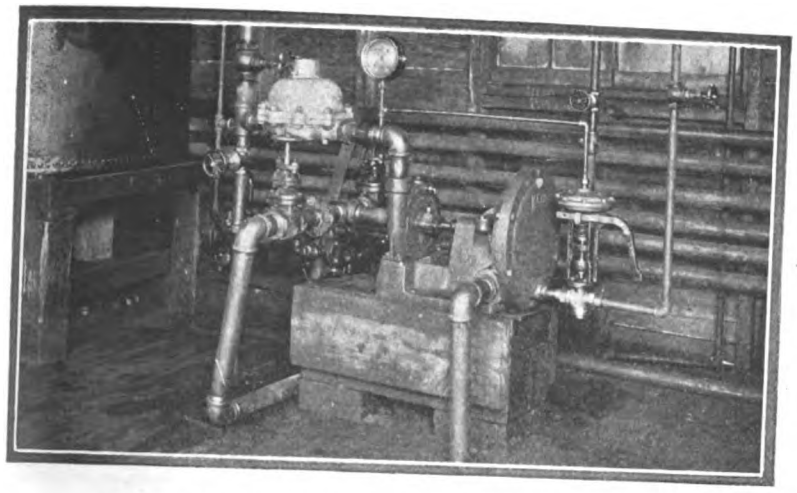


Small steam turbines, such as shown above, occupy very small floor space and are easily operated by common labor. For general conditions their efficiency is on a par with average reciprocating engines of equal power.



This shows the method of installation and operation of the turbo-blower for forced draft service. The propeller housing is inserted directly through the ash pit wall, and delivers air at pressure under the grates.

Digitized by Google



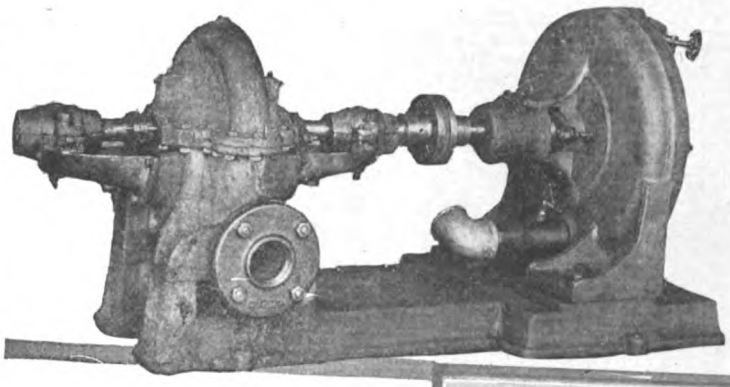
The field of the small turbine is rapidly expanding with knowledge of its useful qualities. For this reason the engineering thought and construction skill formerly applied to large units is now being applied also to turbines down to one horsepower in size. This unit shown is used for pumping gasolene into tank trucks.

and for other essential heat treating purposes. The amount of coal for such work is not influenced in the slightest degree by the amount of power used, or where such power is generated. In some of these factories the efficiencies of the melting furnaces are so low that the steam required for power purposes can be produced almost entirely by the recovery of waste heat from these furnaces. The malleable iron industries are striking examples of the possibilities in this direction. The melting furnaces in malleable iron plants waste more than eighty per cent of the total heat, which is passed off through the chimney, and these furnaces use the very best grades of our bituminous coal.

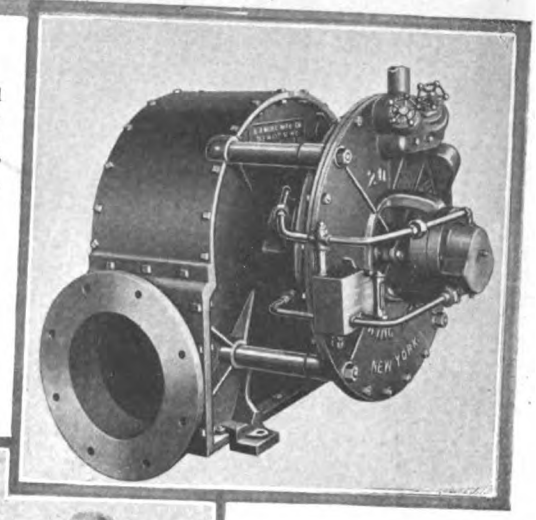
Large spaces have to be heated, not only the places in which the artisans toil, but in many industries enormous quantities of heat are required irrespective of the uses of power, or the number of people employed. Much of this heat is required continuously and is

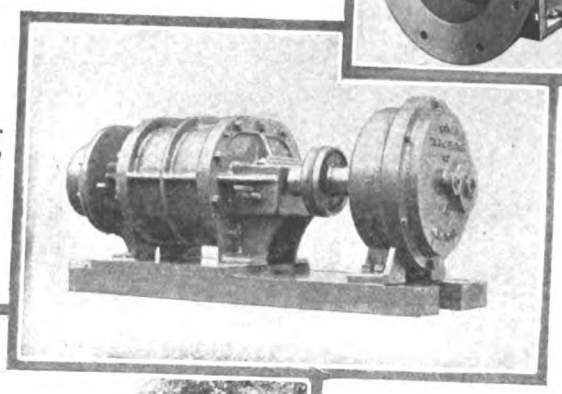
(Continued on page 68)

The 7½ hp. turbo-pump set shown finds many uses. Among them are circulating hot water, circulating oil, priming, and wherever liquid at the rate of 250 gallons per minute or less is required at not over 150 feet head.

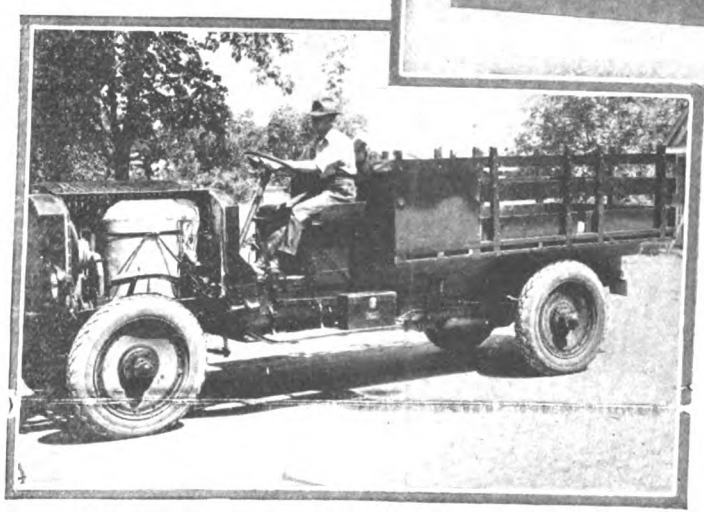


Small units, in blowers, pumps and generators are frequently directly connected to the turbine, or vice versa as in this picture. This adds to portability and does away with a sub-base.

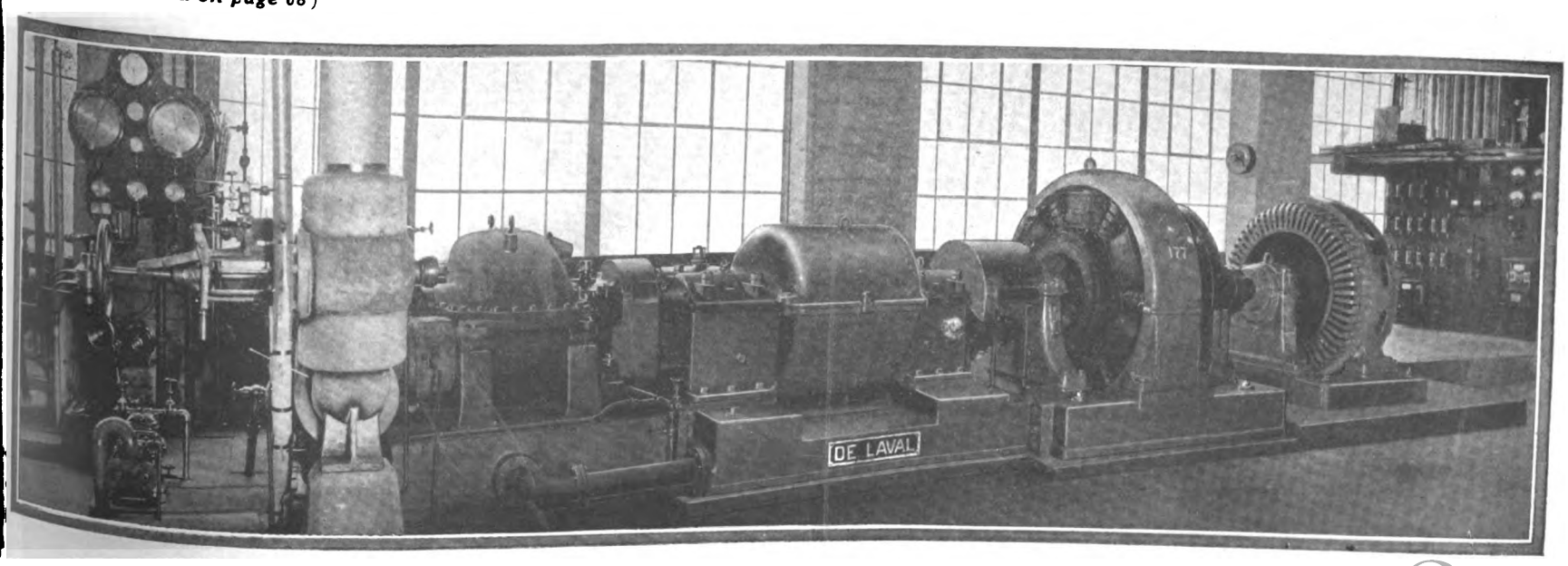




Turbines of fractional horsepower have many useful functions. The unit shown at the right is a positive pressure blower driven by a turbine of less than one horsepower.



The radiator cooling fan of this steam power motor truck is driven by a small steam turbine. This takes care of the pressure drop between exhaust and radiator and puts it to useful work.



Digitized by Google

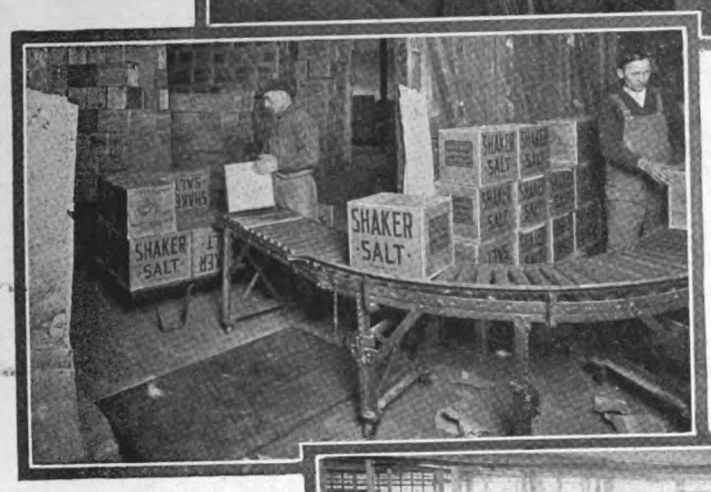
Food Distribution as

The Economies of Large- and Modern Ha

By M. W. Pott



View of the general office where orders are received and store accounts are rendered. Girls with adding machines do most of this work. Note room for expansion. Beyond the railing is the buyers' and manager's office.



Goods are received in car load lots direct on the plant sidings. To save time and expense material handling equipment is used wherever possible. The use of this gravity conveyor in unloading cars makes it possible for two men to unload a car in half the time required before it was installed.



Delays to trucks are impossible in this modern plant. The trucks delivering goods from outside firms are allotted space at the loading platform. The use of skid platforms and electric lift trucks keeps this space clear at all times.



In this warehouse with high ceilings it was found necessary to utilize overhead space. By the use of a tiering truck, and placing one loaded skid on top of the other as shown, the work was done quicker and with a money savings of over $100 per week.



Quick inventory is an essential. This shows the stock record room where a perpetual inventory is kept. The sorting tables contain a card for every item in stock and code cards are so arranged that ordering of low stocks is taken care of automatically.

In this room adjoining the one shown just above the inventory cards are printed, punched, tabulated and sorted. The machine at the left will take a bunch of mixed cards and sort them at the rate of better than 60 a minute.



THE accompanying illustrations present a graphic story of the ordering, inventorying, receiving, storing, distributing, and delivering of groceries and meats in a large modern food distributing plant—that of the H. C. Bohack Company of Brooklyn, N. Y. The entire plant covers 8½ acres of ground and has 235,000 square feet of floor space under cover. The three railroad sidings have a capacity of 43 cars and it is possible to unload at least 15 cars under cover. There is a building which contains the main offices of the company; a large garage and repair shop; a meat storage building with its own refrigerating plant; a coffee department with a daily roasting and packing capacity of 34,000 pounds; as well as the warehouse, where the goods are stored.

This company operates over 200 grocery stores and 100 meat markets on Long Island alone. All these stores are supplied from the distributing plant at least twice a week and some of the closer stores and larger stores are supplied every day. This calls for quick distribution and a smooth running system. The amount of business done in all the stores last year amounted to over $15,000,000 and this year it will be even more. These figures will give an idea of the

Digitized by Google

as an Industry

Scale, Planned Distribution Handling Methods

POTTS

volume of goods handled daily by this plant.

When the orders are written by the store managers they must place them on order blanks furnished by the warehouse or main office. These order blanks are so arranged that the order reads in sequence with the way the materials are stored in the warehouse. This eliminates a considerable amount of walking on the part of the order picker, who takes the goods from the storage skids in the warehouse and places them on trailers. It has been found that by having a certain location for each item, it has increased the number of pieces handled by each picker by 50%, and eliminated mistakes that had occurred in the old warehouse.

Unfortunately the H. C. Bohack Company does not have any records or photographs of the methods of operation in the old warehouse but they do know that their present methods are more efficient and that goods are handled quicker and cheaper than with the old warehouse and old methods.

In a few instances, more recent, methods have been installed and it is possible to point out direct saving effected by the use of material handling equipment. It is the practice of the company to

(*Continued on page 71*)



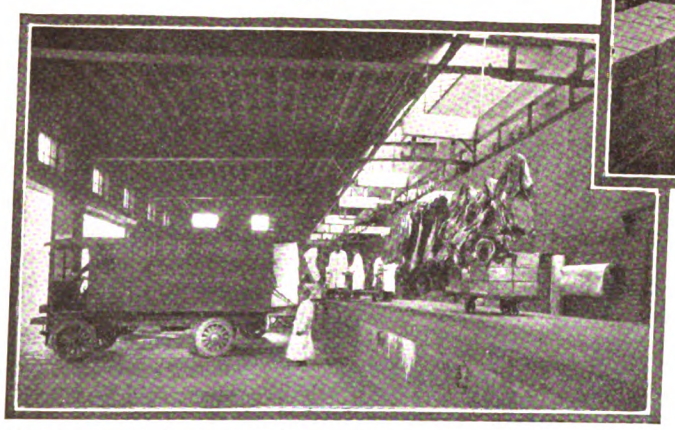
Wide aisles and a complete system of automatic material handling equipment makes it possible for the order pickers to handle over a thousand items in an 8 hour day. The tractor is taking a train of trailers out to the shipping bays and the lift platform truck is bringing a skid load of goods into the allotted space.



The equipment shown has been adopted as standard tractor trailer equipment. The trailers give no trouble in turning corners and require no trucks. Goods are only loaded on trailers when they are to be transported to the shipping bays.



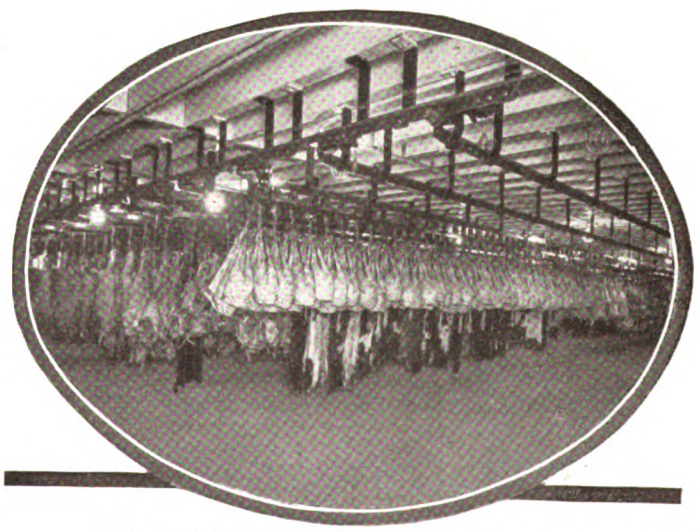
A general view of the shipping platform and method of loading trucks for store deliveries. When the goods are brought out of the warehouse they are placed in the forward bays until they are checked. Then they are moved, by hand, to the further bays where they are again checked before being loaded on the trucks. Frequent checking eliminates mistakes.



In the meat warehouse, all the most up-to-date handling methods are again employed. Boxed meats and small pieces are handled on plain and rack trucks. Sides of beef, calves and other large pieces are handled on overhead carriers. This is the shipping platform for the meat department.



Trucks standing idle eat into profits and delay deliveries. For these reasons the garage is supported by a well equipped repair shop.



This amount of meat is handled daily. The refrigeration for the meat stoarge is furnished from the company's own plant. The main point to notice is the amount of overhead carrier and the way the meat is suspended from individual carriers.

Digitized by Google

A Novel Solution of the Dust Explosion Hazard

By F. C. Allen, Jr.

THE general public is little aware of the great dangers in many industries arising from the dust explosion hazard. That this hazard is real, however, is evident to anyone who will examine a statistical record of dust explosions.

Every year millions of dollars worth of property are destroyed and hundreds of lives are lost through the direct and indirect agency of dust explosions, which of late have been occurring with alarming frequency in a number of industries.

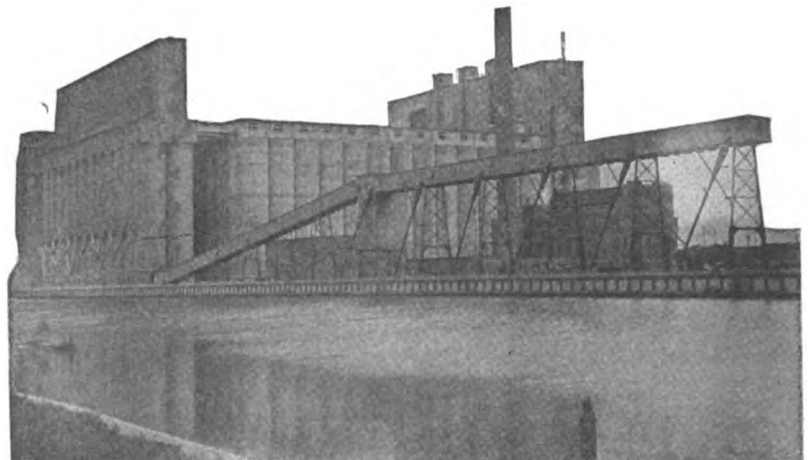
These industries wherein dust explosions occur are usually referred to as the "dusty industries." Among the many "dusty industries" may be especially mentioned grain elevators, coal pulverizing plants, mines, starch factories, aluminum plants, sugar refineries, spice and coffee grinding mills, and so on.

Without attempting to go at length into a general discussion of dust explosions, it may be said, in a word, that the question is one of such vital import to the nation that for some years past a special engineer in the Bureau of Chemistry, U. S. Department of Agriculture, has been assigned to intensive research work in connection with dust explosions in various industries. This engineer is Mr. D. J. Price, who has unquestionably accomplished a great deal, not only as regards the compilation of statistics but also in the direction of research work in determining the causes and recommending means of prevention.

Furthermore the National Fire Protection Association of Boston, Mass., appreciating the importance of this subject, last year organized a Dust Explosion Hazard Committee for the purpose of studying the problems involved and preparing a more or less standardized code of rules and regulations aimed at the elimination of this hazard. Mr. D. J. Price was made the Chairman of this Committee, which is now engaged in this important work.

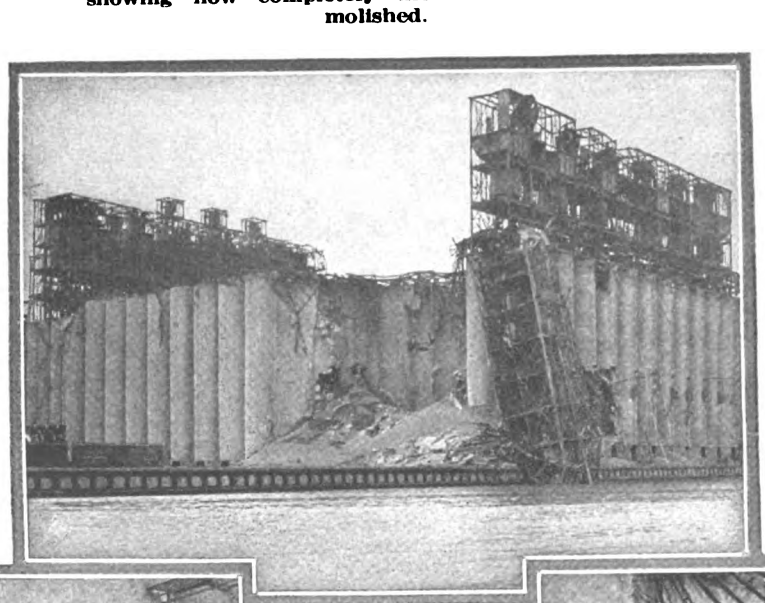
Experiments have shown that a dust explosion is very similar to a gas explosion and as in the case of gases, we find that different dusts are relatively more or less explosive and that different percentages or different "mixtures" of dust produce varying pressures, as in the case of varying gas mixtures.

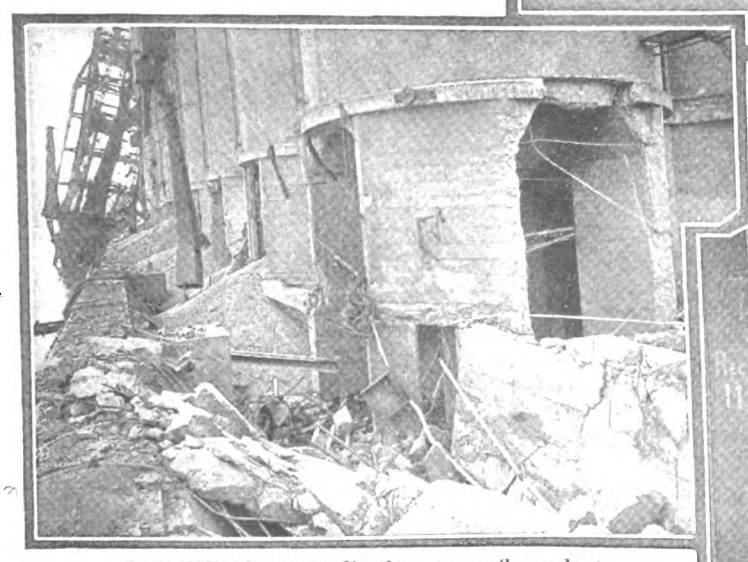
Some of the most disastrous



The Chicago and Northwestern Grain Elevator in South Chicago, as originally built; one of the largest and best built in the world.

Below—after the explosion of March 19, 1921; showing how completely the structure was demolished.





It is difficult to credit that mere flour dust could explode with such violence as this view testifies to.

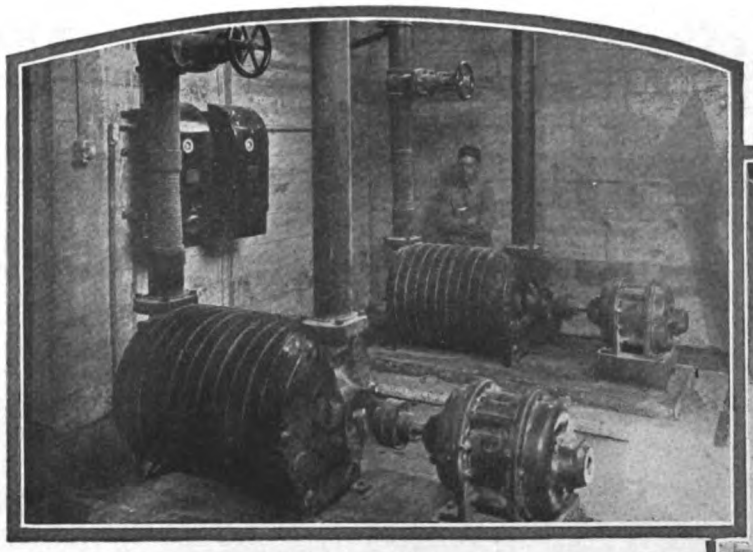


At the right—The method used in the rebuilt elevator, to prevent [illegible] tion of the explos[illegible]



Small wonder that the concussion of this explosion of "ordinary dust" was felt more than fifty miles away.

Digitized by Google



Two of the four large multi-stage centrifugal units which produce the vacuum for static dust removal. Each unit is driven by a 20 H. P. electric motor.



There are several of these large dust filter tanks, which discharge into a low pressure exhaust conveying system by means of ingenious valves that maintain the vacuum during the discharging process.

dust explosions have been in grain elevators, a typical example being the explosion which occurred in the Chicago & Northwestern Grain Elevator in South Chicago, about four o'clock in the afternoon on March 19, 1921. This particular elevator is the largest grain elevator in the world, having a capacity of ten million bushels of grain and one of the accompanying photographs shows this enormous structure as it stood in its massive majesty before the explosion occurred.

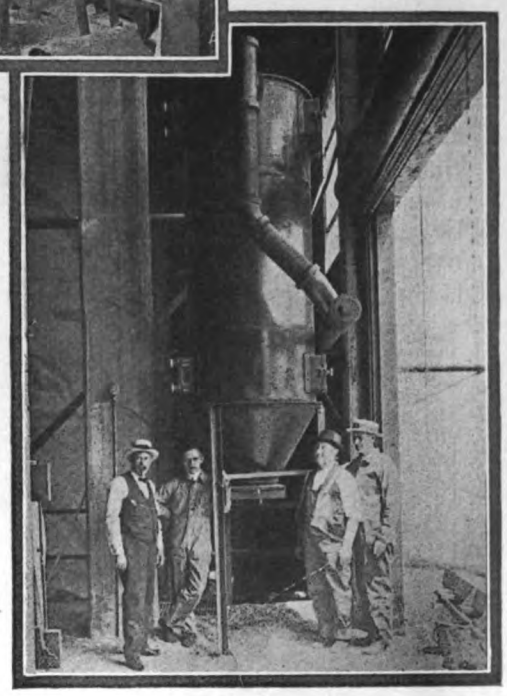
Had the elevator been filled with a charge of gun powder or dynamite the explosion could hardly have been more violent as it was plainly felt throughout the city of Chicago and as far away as Benton Harbor, which is more than fifty miles distant and located on the opposite shore of Lake Michigan.

From the standpoint of loss of life, it is significant to note that every man working in the plant was killed, either by direct impact of flying debris or by the tremendous force of the concussion itself. It was most fortunate that the explosion occurred late on a Saturday afternoon when practically the entire force of men had dispersed for the day, there being only six men left in the plant. All were killed.

Had the explosion occurred during the morning working hours, the loss of life would undoubtedly have been staggering.

The loss of property, including the damage to the elevator

(Continued on page 44)

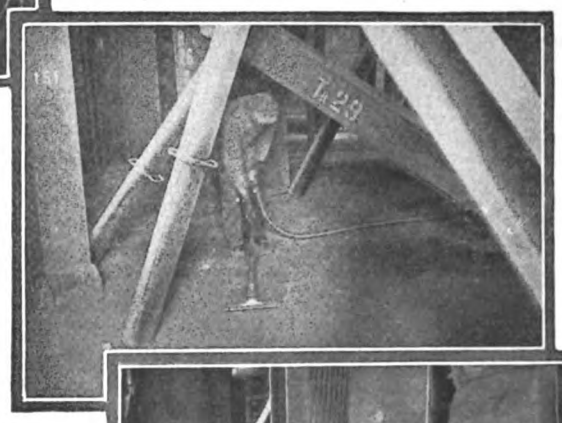


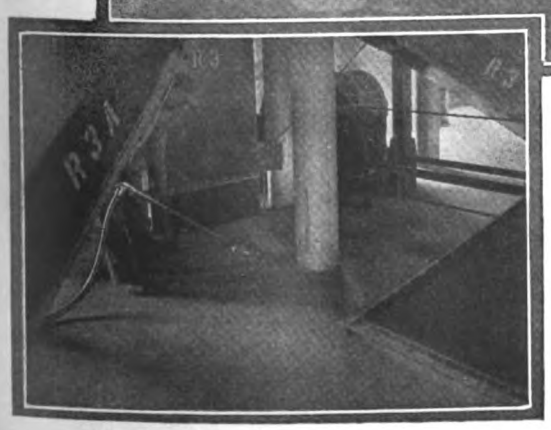
From two to three carloads of dust are collected at this elevator every day, being conveyed by low-pressure exhaust system to the dust house for disposal.





Large accumulations from accidental spills, are removed as shown above, instead of being shovelled; doing away with the dangerous dust-raising incidental to the old method.





The four views grouped at right and left show how the pneumatic system permits of rapid, easy—and, above all, dustless—removal of static dust in all parts of the building.



Digitized by Google

Converting the Airplane to Peace-Time Use

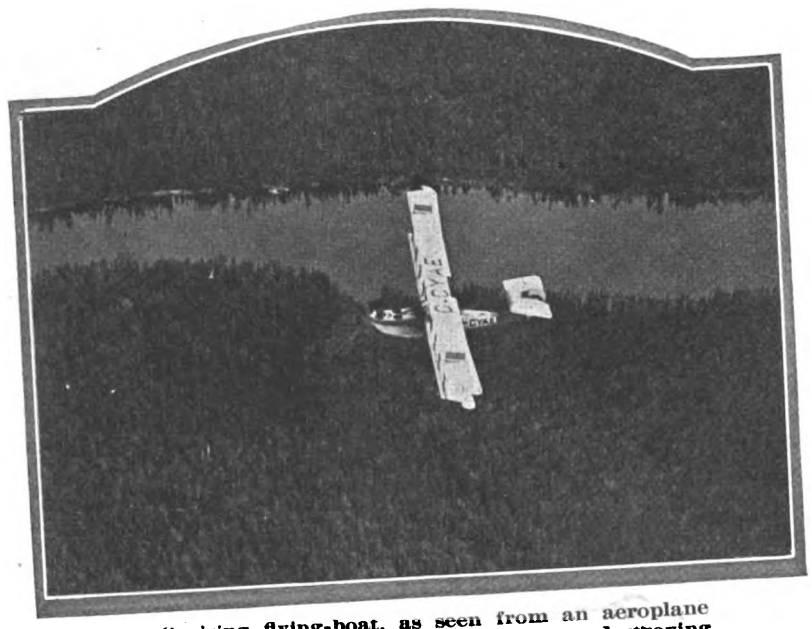
What Canada Is Doing With Her Air Forces

BY D. M. LEBOURDAIS

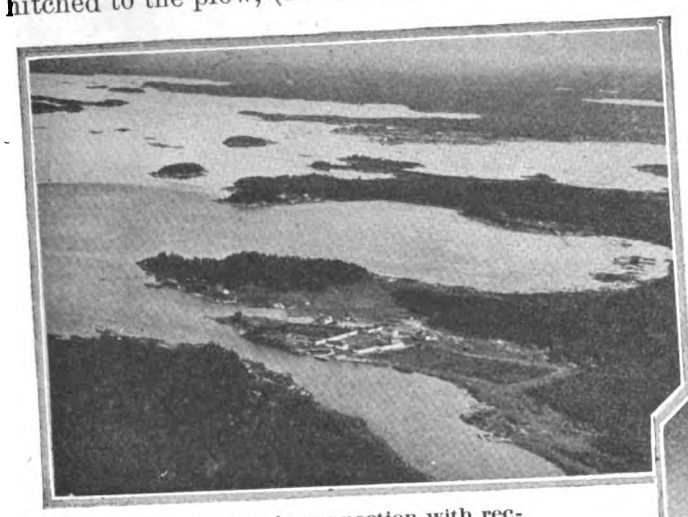
IN olden days the beating of swords into plowshares was not a difficult matter; and it is quite conceivable that a piece of steel which had once done service as a sword would have made an excellent plow. But in these modern days of highly specialized killing the equipment of warfare is not so readily converted into instruments of peace. Heavy long-range guns, quite useful in devastating the face of a fair country-side in war-time, are now of no further utility than to stand as ill-chosen ornaments in our parks and public squares. The great, lumbering tank might perhaps be hitched to the plow, (fashioned shall we say, out of bayonets?) but even so it is doubtful if its work could not be done more quickly and much more efficiently and also less expensively by an ordinary farm tractor; so the tank must likewise be written off as a total loss, save, perhaps, for its value as junk. With the exception of a limited degree of utility in scientific work, such as oceanography, and perhaps polar exploration, the submarine can also be thrown upon the junk heap with the cannon and the tank.

The aeroplane, including the flying boat, however, seems to be the one instrument which,

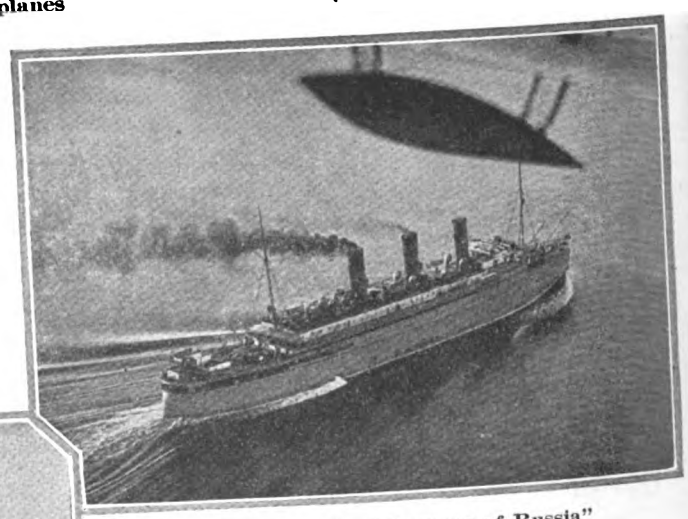
(*Continued on page 84*)



Cruising flying-boat, as seen from an aeroplane above. Studying and combating tree-destroying insects, is one of the new uses for which airplanes are adapted.



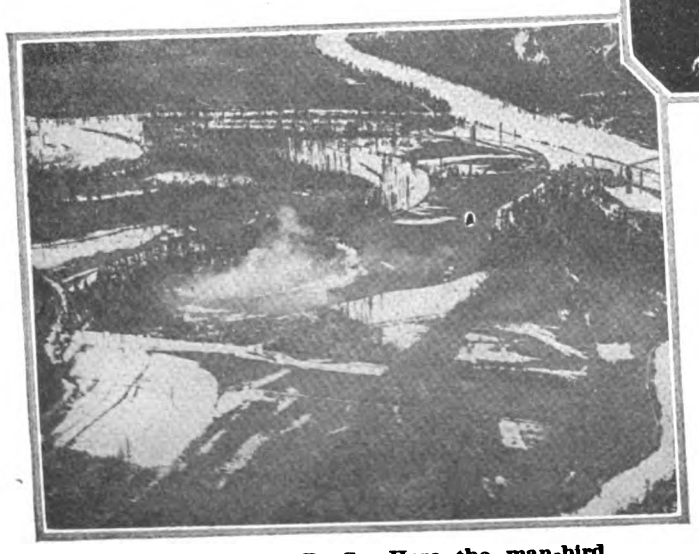
For surveys in connection with reclamation work there is no substitute for the aviator, when it comes to such districts as shown above.



Above, the "Empress of Russia" is being convoyed by an air scout—not as a guard of honor, but to circumvent smugglers.



The Cascade Mountains, British Columbia, where seaplanes were used to locate primary triangulation stations for geodetic survey.



Fraser Valley, B. C. Here the man-bird was used to survey flooded areas for location of mosquito breeding places.



Not only can the aviator discover a forest fire, but he can reach it and summon aid in a fraction of the time required by rangers on earth.

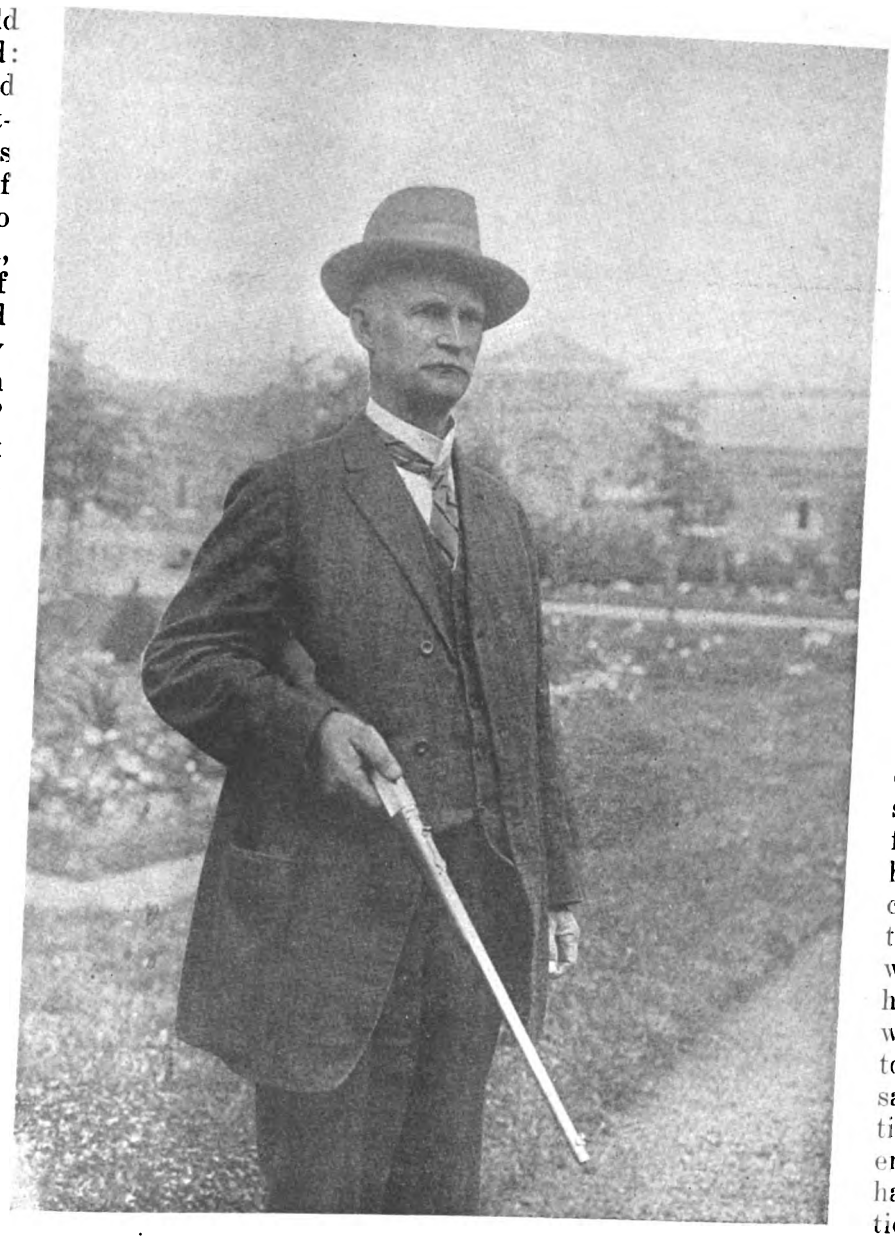
Digitized by Google

The Man Who Converted a Bark into a Bite

The Career of John M. Browning, Inventor of the Machine Gun

BY ERNEST H. ROWE

WOULDN'T it seem queer, ye lovers of Wild West tales, to read: "With his insolent, twisted leer, Two-Gun Pete significantly tapped the holster of his Browning .45 ..." instead of his Colt .45? Or, "As those two flaming eyes confronted him, Jack brought the blue barrel of his Browning to his cheek and planted a rifle ball squarely between them," rather than his blue-barreled Winchester? Or, again, "As the great flock took wing we let fly at them with our Browning pump guns"? Or, still again, "our hero, with affected carelessness, slid his right hand into the pocket of his coat and felt the comforting support of having the desperado covered with his Browning automatic"? But those alterations would be true, nevertheless. Winchester, Colt, Remington, Stevens,—breech loader, repeating rifle, auto-loading shotgun, pump gun, automatic pistol, light machine rifle, heavy machine gun,—nearly all are the inventions of John Moses Browning. Indifferent to the fame of christening his brain-children with his own name, he leaves that distinction to the manufacturers. It was not until Uncle Sam commandeered his genius for war service and he responded with a world-beating trio of machine guns, invented to order, that we ever heard of a "Browning gun."



John M. Browning, who not only invented the three machine guns which played such an important part in the late war, and which bear his name: but who is also the inventor of most of the Winchester rifles, Remington auto-loading shot gun and auto-loading rifle, Stevens 12-gauge repeating shot gun, Colt automatic pistol and numerous other weapons of war and sport.

You are safe in calling John M. Browning an American, for every connotation of the word is exemplified in him. Ancestry and nativity?—he is of the eighth generation descended from that Captain John Browning who came over from England exactly three hundred years ago in the "Abigail" and settled in Virginia only two years after the Pilgrims landed on Plymouth Rock. Pioneering?—his father was born in Tennessee, he moved to Iowa, then in '52 he trekked again by ox-cart to Ogden, Utah, which had been settled the year before. There, on Main Street, John M. was born, January 23, 1855. Hardy rearing?—when your father is a blacksmith and gunsmith in a small frontier town, and you are the thirteenth of his twenty-two children, there's no lap of luxury about his leather apron to make you soft. Schooling?—the common school, the great outdoors, his mother's knee, his father's shop. Brains?—he probably never heard of ballistics until the gold braided professors of military science asked him to come East and tell how he made pistols and rifles do the things they talked about and charted on paper. He does not think in abstractions; his mind works directly with the concrete materials that make guns; his very brain cells, if you could get them under a microscope, must be arranged in firearm patterns. Ingenuity?—he made his first gun himself, when he was thirteen years old, out of scraps kicking around his father's shop. When he had an idea that there was energy to spare in the expanding gases when a gun was fired, which he might put to work, he found out by a device of his own. He placed a .45 against a board with a .45 hole in it directly opposite the bore of the gun. When he fired, taking the precaution to pull the trigger with a long string, the gun was kicked clear across the room by the pressure of the gas which followed the bullet and spread at the muzzle the instant the ball was clear.

Business sense?—an inventor who makes a million dollars a year hasn't let anybody exploit him. Character, square dealing?—the manufacturers who make his guns have become great, rich concerns with world-wide prestige; and there is not a man with whom John Browning has ever done business who would not welcome the chance to deal with him again, on the same terms. Love of his native land?—there isn't money enough in the world (and he has handled a pretty fair fraction of it) to make him anything but John M. Browning of Ogden, Utah, nor to get him away for very long except when, once in a while, some king sends for him to please come over long enough to get decorated. Democracy, unostentation?—whatever they do in Ogden nowadays which is the equivalent of sitting on the fence, chatting and whittling, you probably will find Browning doing any time he is not at work on a new gun. But for the fact that he and his ancestors have never lived anywhere but south of the Mason and Dixon line, you would say he looks like a Connecticut Yankee. The real Connecticut Yankees, of Bridgeport and

(Continued on page 34)

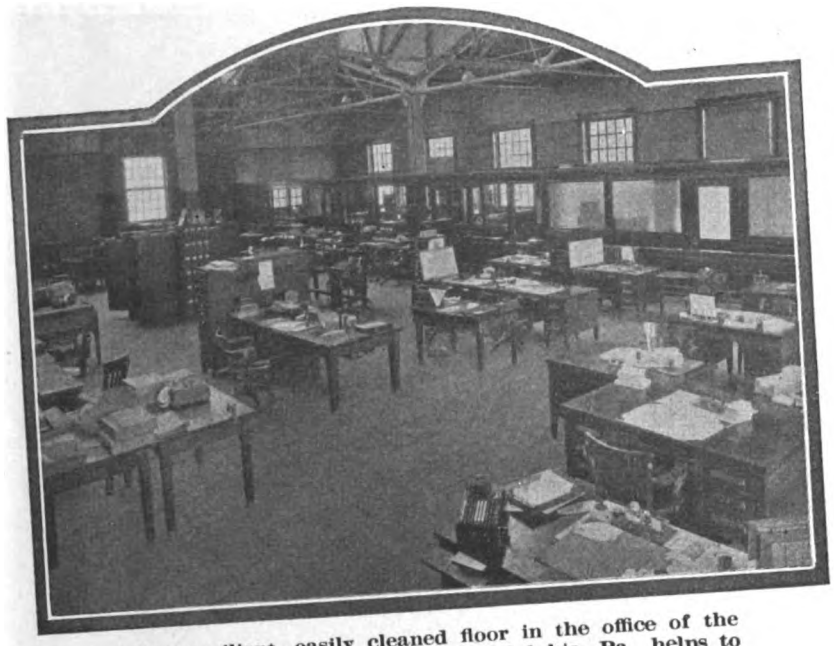
Digitized by Google

Modern Factory Maint-

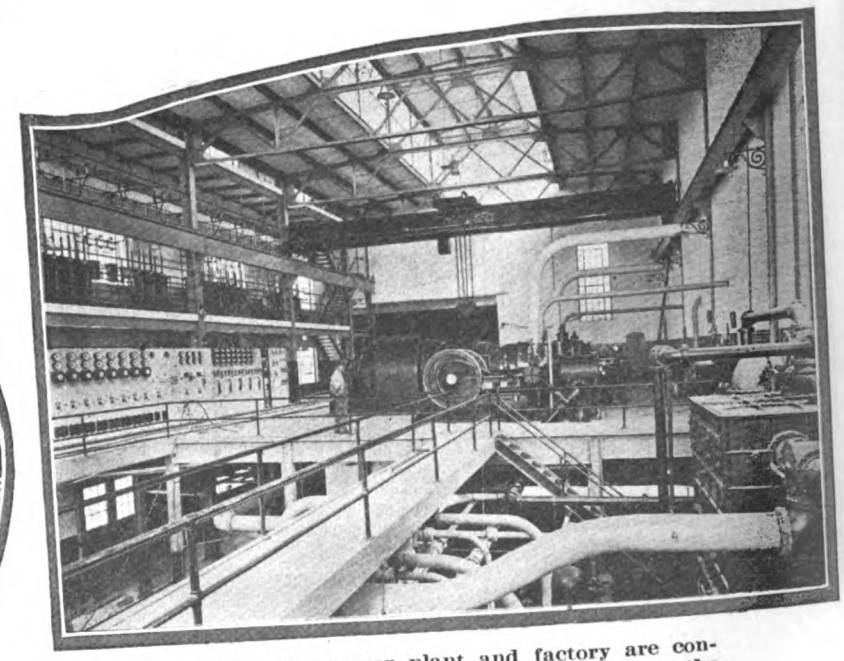
BY JOHN H.

COMPARATIVELY few people know how closely factory floors are related to profits—or losses. Yet the relationship is simple and obvious when one thinks about it. Progressive factory managers have been thinking about it for a number of years which accounts perhaps for the remarkable development that has come about in the factory floors of today.

It wasn't so long ago, not more than fifteen or twenty years, that floors in factories were given but little thought. Perhaps this was due to the fact that "out of sight is out of mind" and most factory floors in those days were so cluttered and covered with all sorts of materials and parts that very little of the floors themselves were visible. Sometimes these floors were made of dirt, par-



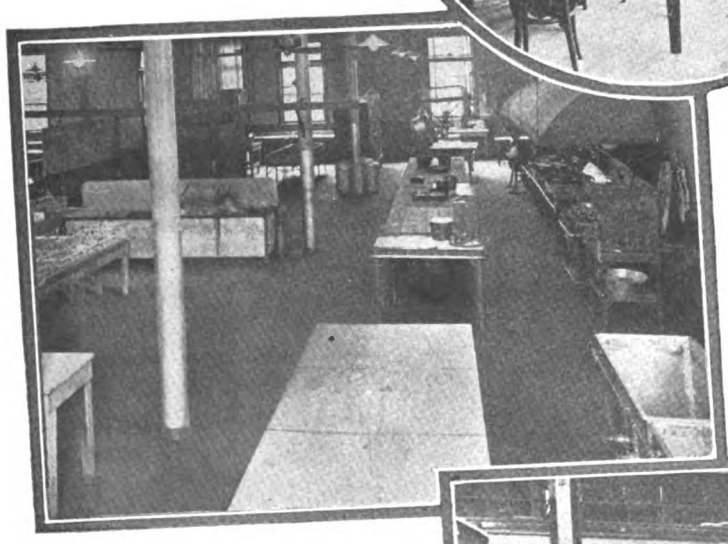
This resilient, easily cleaned floor in the office of the American Pulley Company, Philadelphia, Pa., helps to expedite production as well as to convey the idea of neatness.



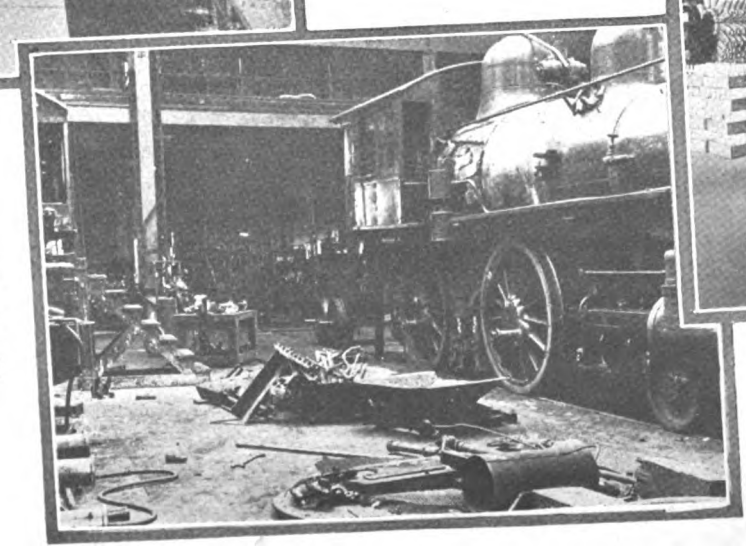
Today the power plant and factory are considered as deserving of a good floor as is the office. Here is the power plant of the D. L. & W. R. R. at Nanticoke, Pa., with its non-abrasive and dustproof "Marbleloid" floor.

Ancient floors are not compatible with modern industry. So the cafeteria and the plant kitchen—both modern developments—have modern floors, easy to clean and to keep clean. At the right is the cafeteria of the Studebaker Corporation, at South Bend, and below the kitchen of the G-E restaurant at Schenectady.





The heavy pieces handled in a railroad shop provide severe service for floors on which they are piled, or sometimes dropped by careless workmen. Here is a corner in the Rutland, R. R. shop at Rutland, Vt., with its Johns-Manville "Industrial" flooring.





Whether the non-slipping qualities are as necessary now for brewery floors as before the Volstead era, is a question. Nevertheless, here is the bottling department of the Pabst Brewing Company, of Milwaukee, with a dustless, sanitary, non-slipping floor surface.

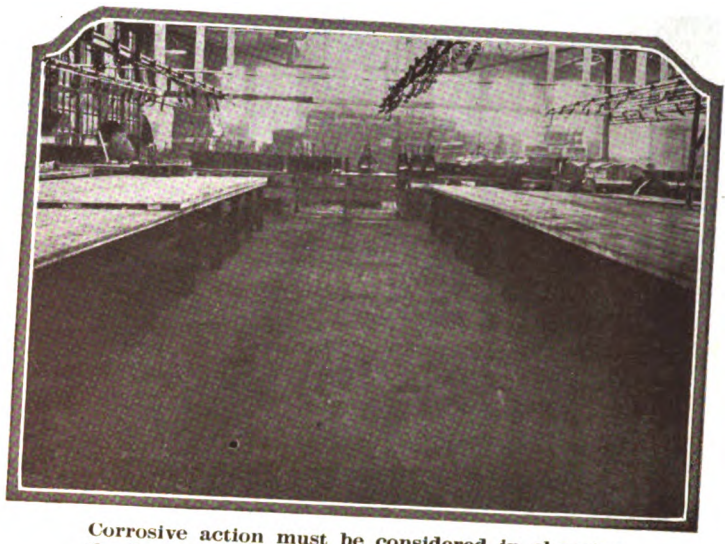
Digitized by Google

Floors and Their enance

VAN DEVENTER

ticularly in foundries. Occasionally one encountered a concrete floor but this was a rarity. The old standby was the oak plank laid upon stringers with knot holes for the convenience of the numerous rats and mice that infested the average factory. Sometimes too, these knot holes were a convenience in the absence of telephone systems when you wanted to communicate with a person on the floor below.

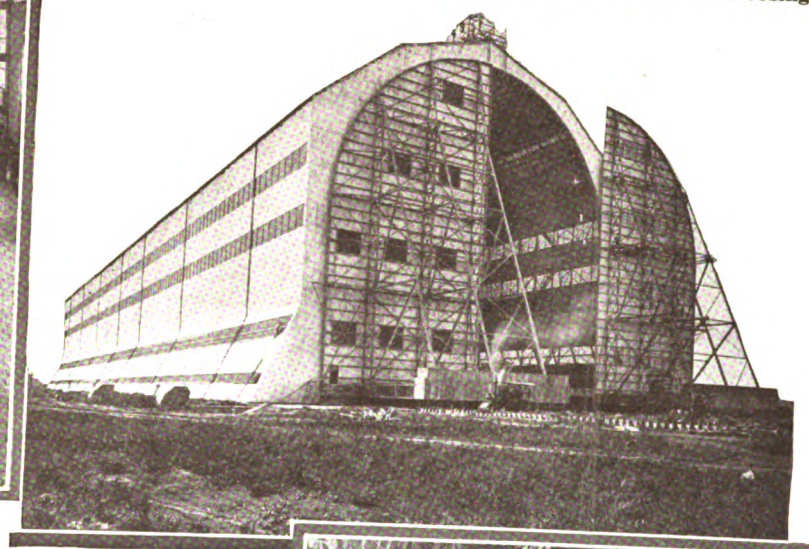
If you encounter a present day factory which has one of these old style floors that is cluttered up, dirty and full of knot holes and splits, you are safe in assuming that it is not making money very fast. For as said at the beginning of this article there is a definite relationship between factory floors and profits.



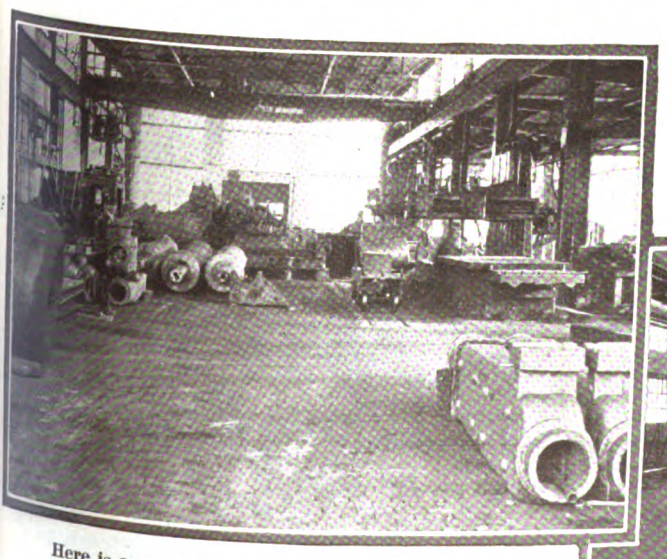
Corrosive action must be considered in choosing the floor in a chemical or acid using plant. Above is a battery assembling room in the Willard Storage Battery Company of Cleveland, which kept this point in mind in choosing its flooring.



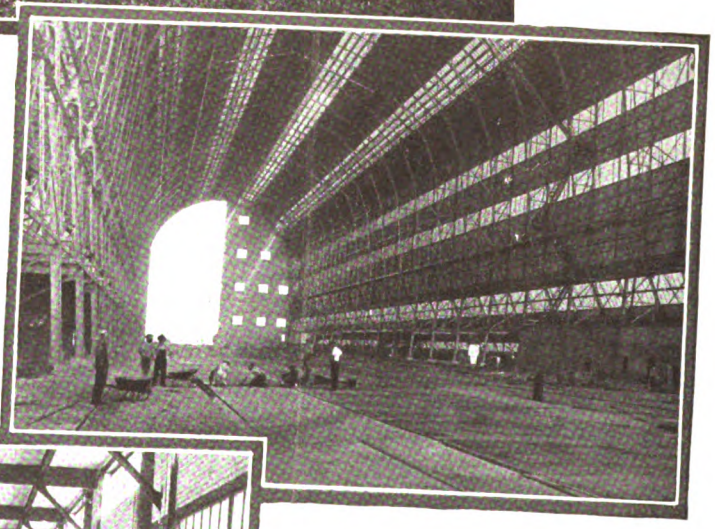
A "Kredom" wood block floor as installed at the plant of the Duplex Printing Press Company of Battle Creek, Mich. The blocks are set in hot pitch.



Laying the monolithic, mastic or asphaltum floor in America's biggest hangar, at Scott Field, Ill., the exterior of which is shown in the upper picture.



Here is a wood block floor which is subjected to severe loads of heavy castings, at the Fulton Foundry and Machine Company of Brooklyn, N. Y.



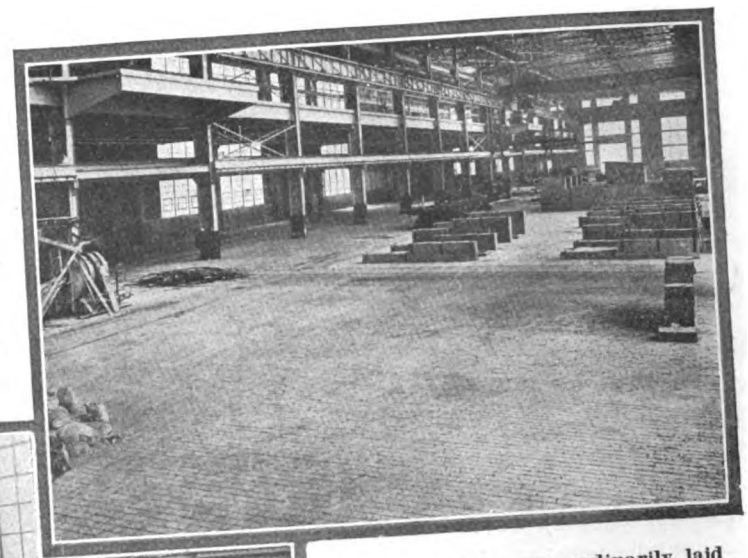
This new Union Pacific freight terminal, at Los Angeles, Calif., has a Vulcanite Mastic floor of 37,500 sq. ft. This floor is 1½ in. in thickness.

Digitized by Google



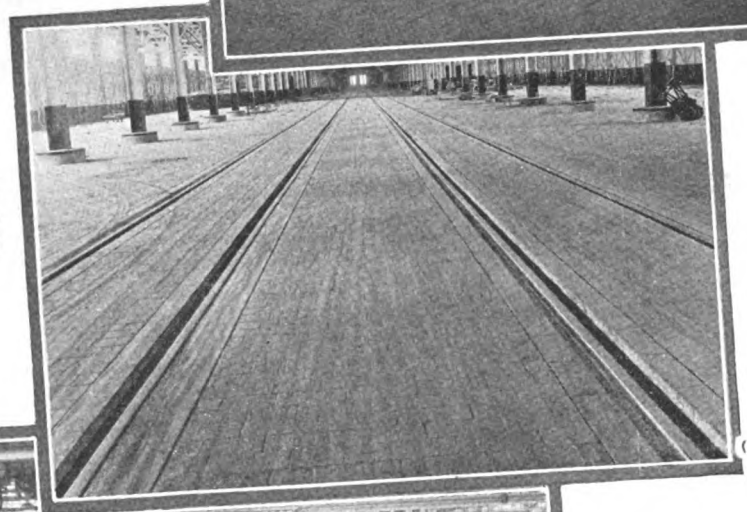
Getting ready to set wood blocks in a pitch binder, on concrete. Wood block floors are cool in summer, warm in winter and easy on the feet.

Asphalt block flooring, in its modern development, is admirably suited for factory floors. At the right is a view of the erecting shop of the Westinghouse Electric & Manufacturing Company at Essington, Pa., with its "Hastings" floor.





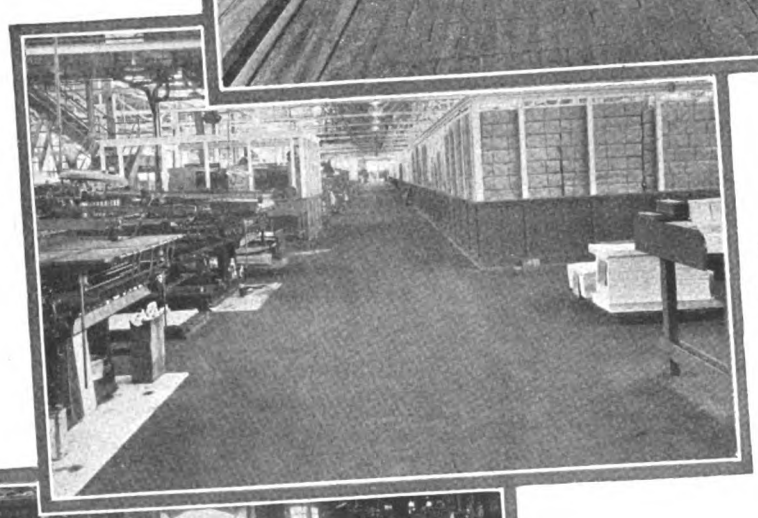
Asphalt blocks are ordinarily laid upon a half-inch mortar bed which is spread over the surface of the concrete base. The view at the left shows such a floor being laid in one of the American Cooper Products Company plants.



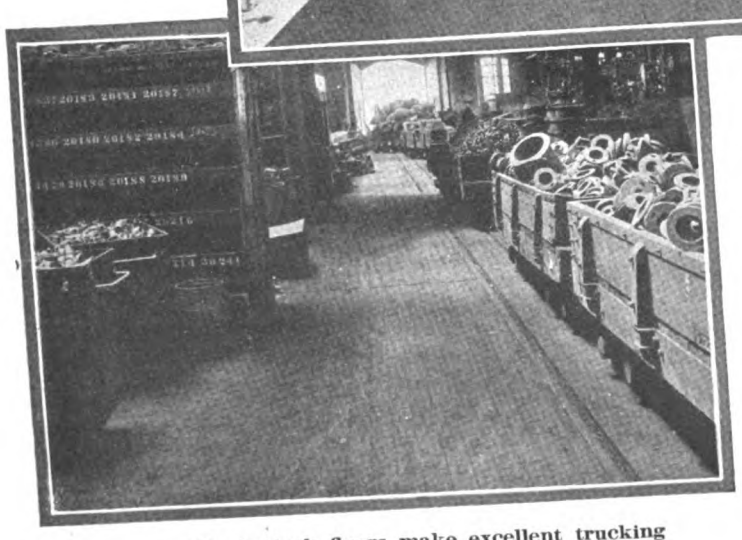
This is a portion of pier No. 4, U. S. Army Supply Base, Brooklyn, N. Y., paved in 1918, with 950,000 sq. ft. of asphalt blocks.

This relationship is summed up in the word *transportation.* The floor of a modern factory is not merely something to walk upon nor to pile parts or materials on, but is an integral part of the transportation system. The transportation system in turn is today a very definite and large part of the process of manufacture, determining its efficiency and hence the resulting profits. Thus the floor links up directly with the owner's or stockholder's pocketbook. Transportation, in other words, is the thing that has developed the modern factory floor.

Lift trucks, tractors and trailers have played a large part in this development. Not so long ago one can recall the days of the two-wheeled hand truck, whose chauffeur exerted his agility and ingenuity in dodging in and out of obstructive passage ways. In those days the stock room was most frequently found in the manufacturing department where piles of idle stock ate up floor space charges, and ac-



"Kreolite" wood blocks are used in this floor at the National Cash Register Company of Dayton, Ohio. The individual blocks are bound firmly together by means of a bituminous filler.

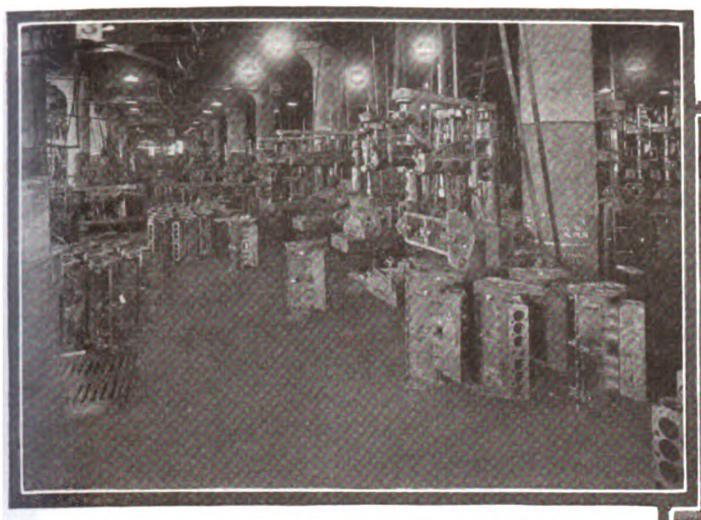


Wood block floors make excellent trucking surfaces, being resilient and quiet. Above is one of the stock room bays of the Westinghouse Air Brake Company of Wilmerding, Pa., floored with wooden blocks.

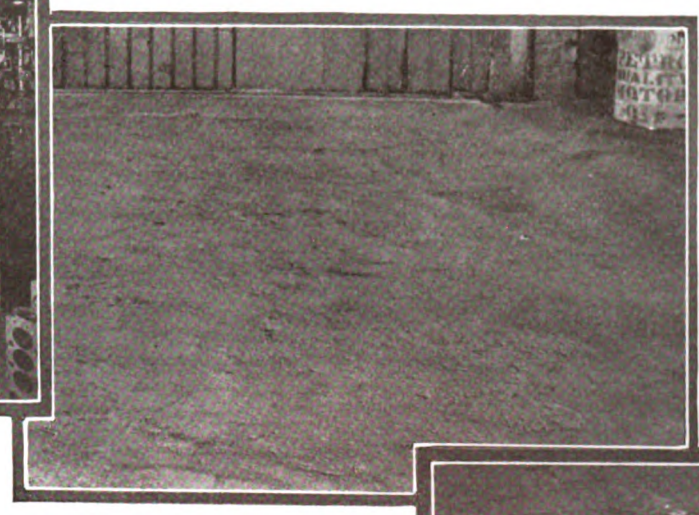


Underneath this hardwood floor and its base planking, in the Hoosac Cotton Mills, North Adams, Mass., is a "Tar-Rok" sub floor.

Digitized by Google



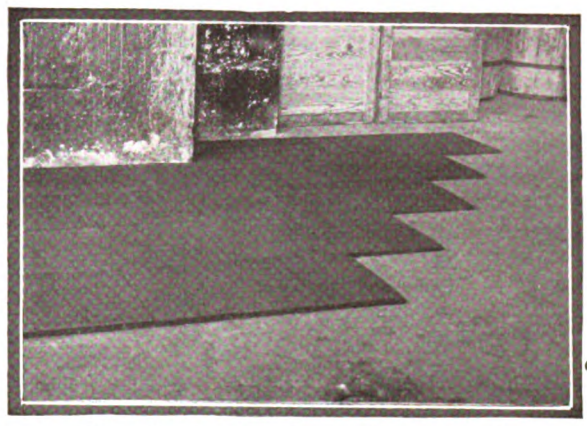
Moisture-proof and air-proof sub floors not only protect the manufacturing department and its contents from dampness, but preserve the floor itself from mildew and dry rot.



Concrete floors are too well known to need illustration. But, as the Maintenance Engineer points out, they need proper maintenance. Witness (at left) this floor from which the topping has been worn off.



The rut in this floor is at a joint or seam in the concrete. When such joints are not well bonded, soft spots are likely to develop.



Fibre flooring, made as a by-product by the Endicott Johnson Corporation, in connection with their tanneries and shoe factories, is a recent development. It is really a leather floor.

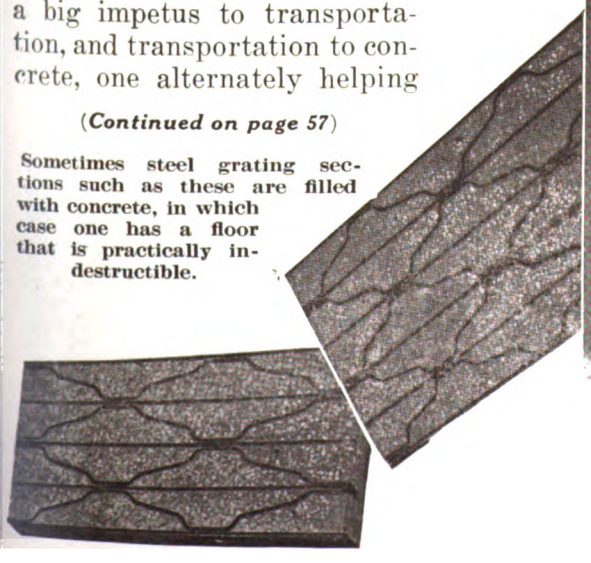


Here is a "scaled" concrete floor. When a floor has this appearance you can be pretty sure that it has been frozen. Proper mixing, surfacing and "hardening" will avoid such conditions.

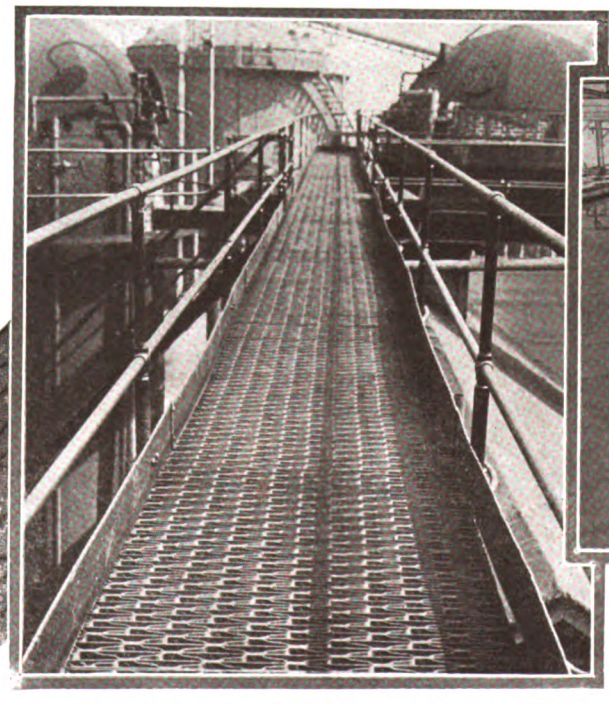
cumulated interest, to say nothing of getting in the way of so-called production. With the coming of the four-wheeled hand-drawn truck the question of factory "navigation" became more difficult. Hence foremen began to push material out of the passage ways and maintain more or less definite roads of traffic. Also heavier weights carried by these trucks exceeded the sustaining power of the crudely built wooden floors. Thus when concrete made its appearance it was welcomed as a means of preventing industrial train wrecks. Many are the crowbars that have been applied in lifting out the wheel of an old-time shop truck tnat had caved through an old-time wooden floor.

Concrete, of course, did a great thing for shop transportation in providing a continuous, hard and smooth surface over which it is easy to push or haul heavy trucks. Even today one finds many industrial floors of this material, and they cannot be excelled for durability and serviceability when properly hardened, mixed and surface-treated. Concrete gave a big impetus to transportation, and transportation to concrete, one alternately helping

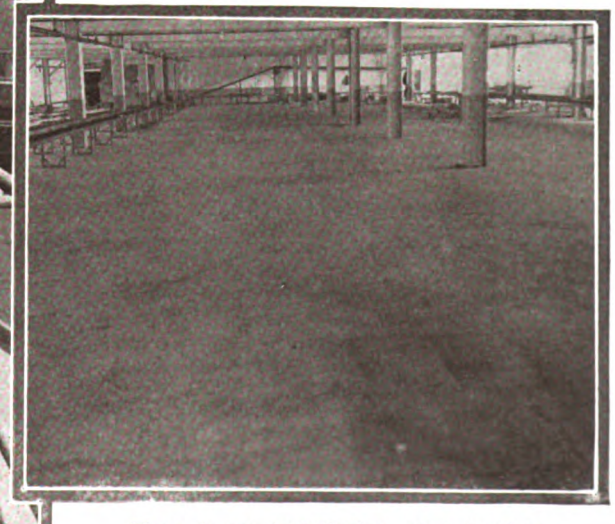
(*Continued on page 57*)



Sometimes steel grating sections such as these are filled with concrete, in which case one has a floor that is practically indestructible.



Steel flooring has come to be recognized as filling an important factory need, both inside and outside the plant. Here, for example, is a "Kerlow" steel walkway in the plant of the Vacuum Oil Company of Olean, N. Y.



Here is an installation of a leather fibre floor. It is non-inflammable, a non-conductor of heat and "easy on the feet."

Digitized by Google

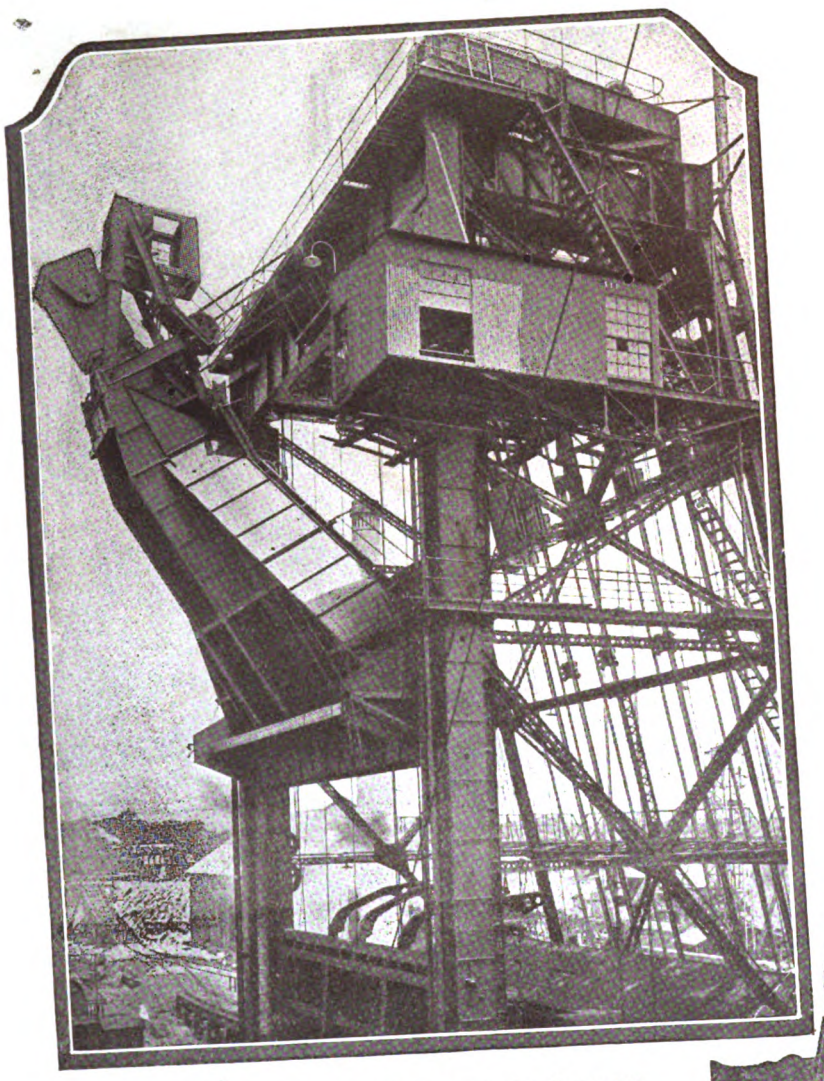
Transporting Coal from Mine to Waterfront

By J. F. Springer

COAL mines are, as a rule, located more or less in the interior of the country. There are a few exceptions, as for example mines in the Cape Breton region. In fact, there is some coal mined underneath the sea in this section. But the exceptions to the general rule serve to emphasize that rule. In general, coal that is destined to reach the waterfront must be transported over a considerable land interval.

A fair proportion might be carried by interior water routes from the immediate vicinity of the mines to the seaboard, but this method is not in very important use in the United States. Coal mined along the Monongahela River in Pennsylvania and along the Kanawha River and tributaries in West Virginia could be transported by the Ohio-Mississippi route in great quantity. As an actual fact, only a moderate tonnage utilizes the possibilities of water transportation. It is not altogether clear why a greater traffic has not come into existence.

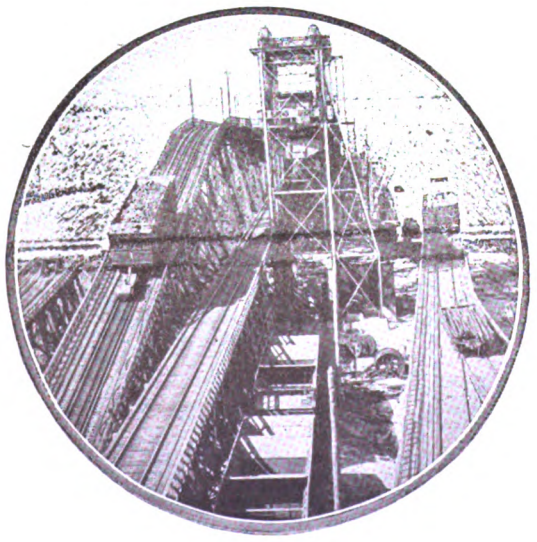
The general method is substantially as follows: The coal leaves the vicinity of the mines in barges of moderate size. These are assembled in groups and steered down the Ohio River as far as Louisville, Ky. Here are located the Falls of the Ohio. Either the group and the steamer managing it must pass these dangerous rapids at as favorable an opportunity as offers, or the group must be broken up and the barges



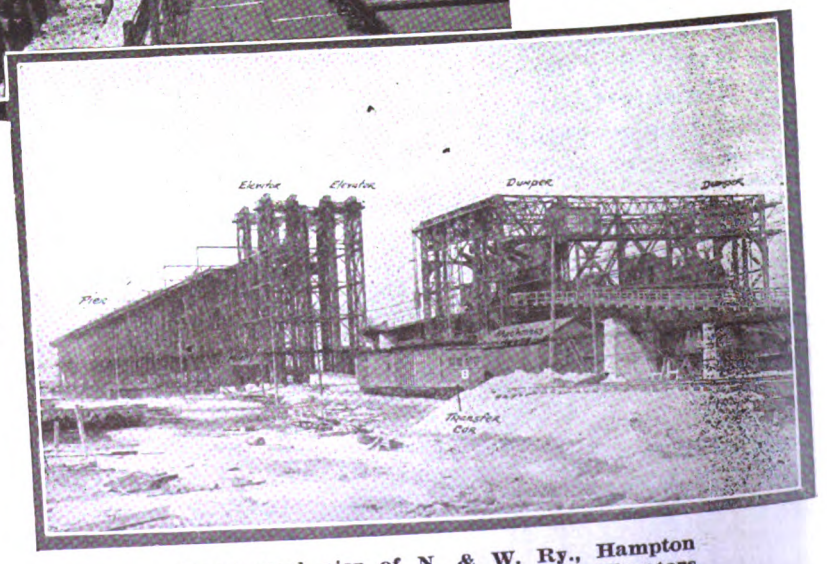
Side view of one of the great car dumpers. The pan or apron is here thrown up out of the way, the dumper not being in use at the time.



Big car dumper at Toledo, Ohio, dumping coal into a whale-back alongside. Hocking Valley R. R.

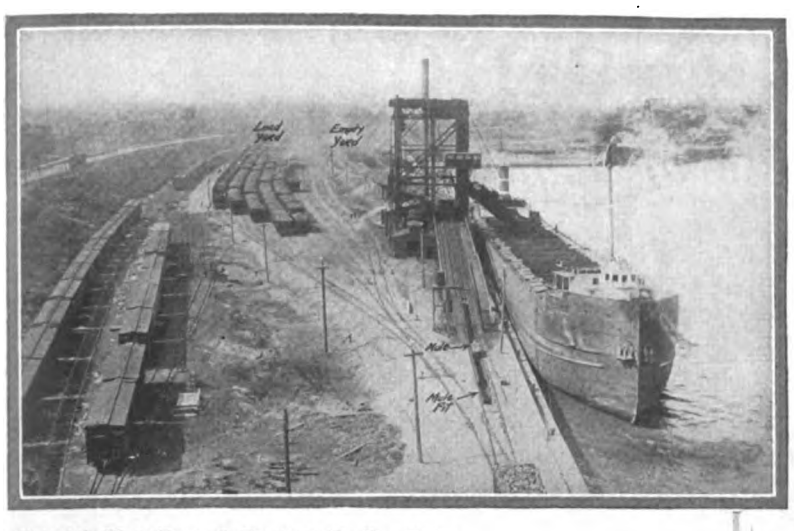


Upgoing track (on left) and return track (on right). Loaded car is being pushed up by barney.

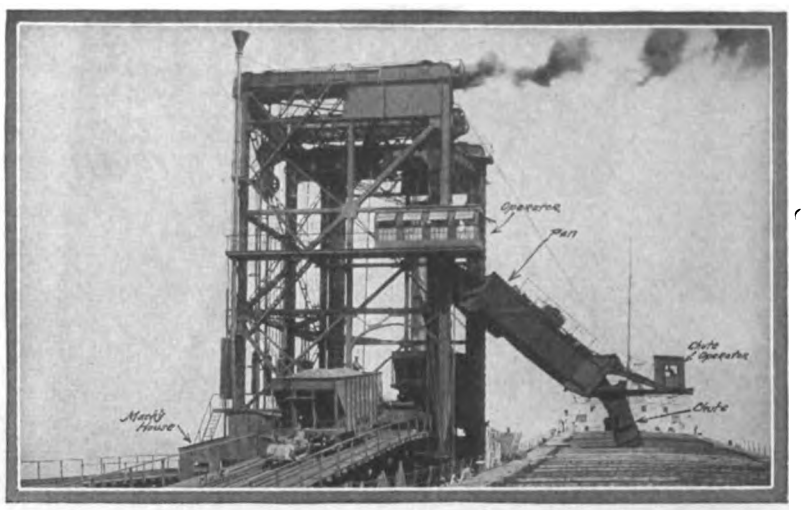


Great steel pier of N. & W. Ry., Hampton Roads, Va. Car dumpers on right. Elevators at land end of pier. Pier deck about 90 feet above water.

Digitized by Google



Cincinnati, Hamilton & Dayton R. R., Toledo, O. Load yard and empty yard.



Pennsylvania R. R., Sandusky, O. This particular machine has unloaded at the rate of 45 cars per hour.

passed through the channel and locks of the Louisville Canal to the Ohio River beyond the Falls.

It is quite customary to regroup the barges into much larger aggregates than are used above the Falls. There may be as many as fifty-odd 1000-ton barges or boats in a single new group. A stern-wheel steamer is nosed in at the rear and the whole starts downstream. The current serves to do the real hauling. The steamer at the rear acts as a means of control. The destination may be the waterfront at New Orleans or at some intermediate city.

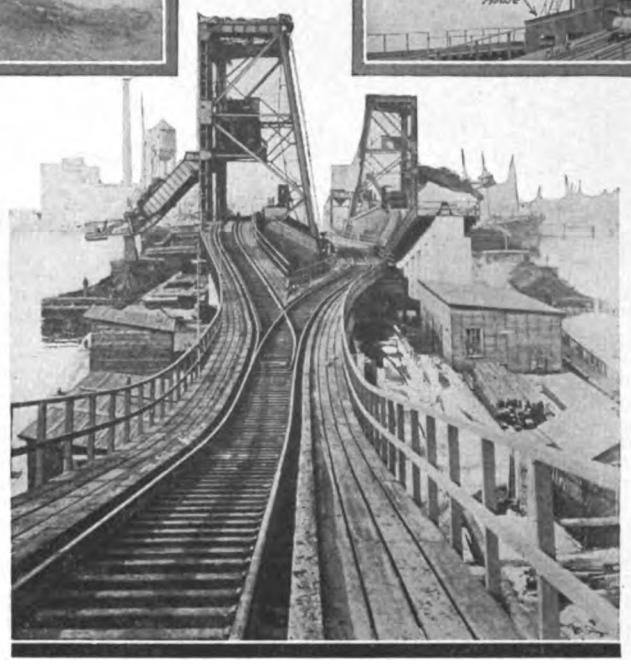
The barges may be sold for lumber at the southern destination, or they may come back empty. Or, if fortunate, they may bring a partial load of raw materials or manufactured articles.

The foregoing will serve to cover that part of transportation from the mine that is accomplished by means of waterways. The Ohio-Mississippi route is the only important water route for coal in the United States. There is another that may ultimately become of importance. It seeks to deliver coal from the Warrior coal fields of northern Alabama at New Orleans. The rivers are used until the Gulf of Mexico is reached, when a short cut is made west to the Mississippi River or vicinity.

These examples of water transportation do not handle a considerable fraction of the total transported from the mine to the seaboard and other waterfronts. It is the railroad which carries the bulk of this traffic.

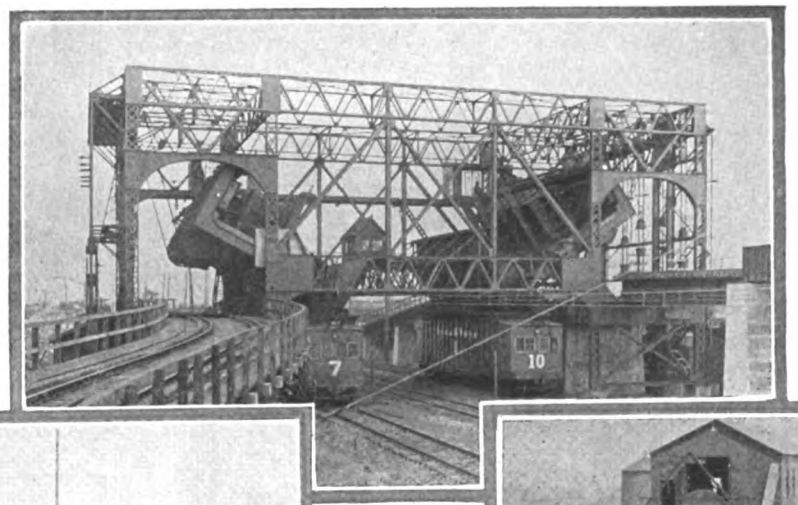
There are naturally various methods of getting coal from the mine's mouth to the railroad. Many, very many, American mines consist of workings that open on the side of a hill. The vertical hoist is absent. Examples of this type may be found in the Pittsburgh region. Then, there are mines which are altogether down underneath the surface and have no communication with the outside world except through vertical shafts. Then again, there are mines that do not correspond to one's expectations at all.

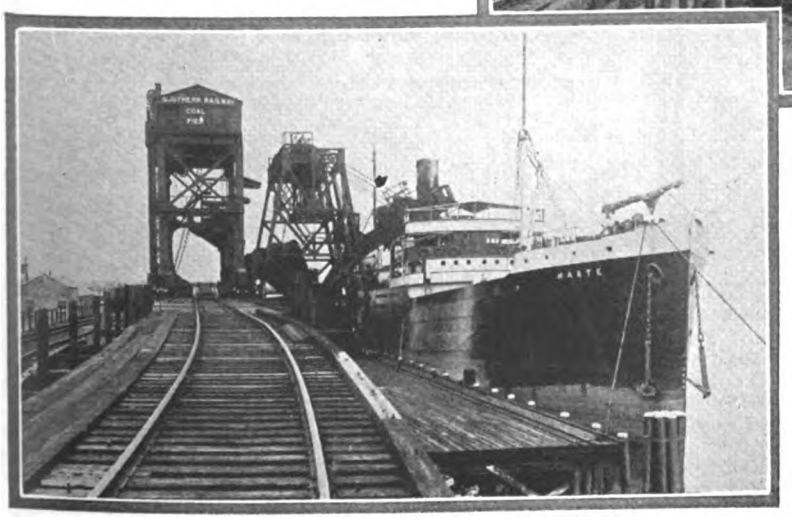
(*Continued on page 27*)



Central R. R. of N. J. Two car dumpers, Jersey City pier. On left, barge being loaded by the dumper near-by. Return track in foreground.

N. & W. Ry., Hampton Roads, Va. Twin car dumpers loading special pier cars preparatory to going out on pier 90 feet above water.





Southern Railway, Charleston, S. C. Car dumper on left. Delivers to loading machine to its right. Vessel still further to right.



Virginian Railway, Hampton Roads, Va. On left, cradle is overturned. Bars and wire ropes which retain car are visible.

Digitized by Google

What's in a Name?

The Name Applied to Any Piece of Equipment Should Embody the Description of Its Use and Utility

By Matthew Williams

THE question, "What's in a name?" has always been considered more or less as a joke, but some jokes are expensive. There are several ways that a joke can be made expensive; first, by injury to a person and second, by injury to a business.

The material handling equipment industry is still in its infancy and therefore carries a lot of misnomers. Like calling a small baby "Sweetie" and then continuing to apply the same title after the baby becomes a grown man of large proportions, the title wouldn't fit; and the same is true about much of the material handling equipment.

In order to get the attention of a prospect, the title should cover the broadest field of the equipment. For instance we will take the piece of material handling equipment commonly called, TIERING MACHINE and consider what this term implies. Tiering implies piling, and therefore we are led to believe that this machine can only be used for piling materials. This belief is



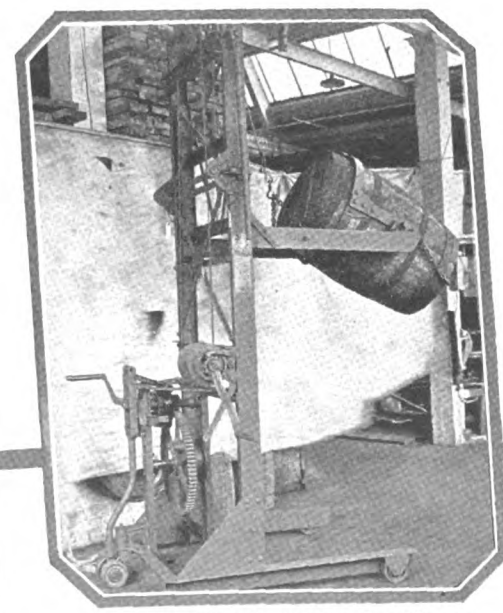
A Tiering machine being used as a tiering machine to pile rolls of wire. This is only one of the many operations that this type of equipment can be used on and that is why the name is really a misnomer.



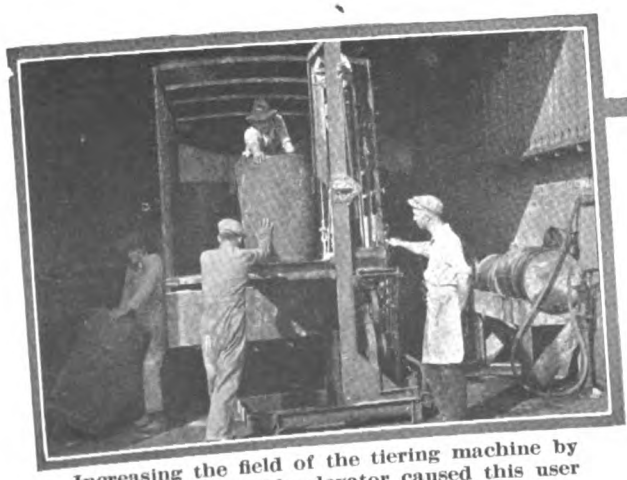
Another use for a standard tiering machine. Consider the advantages of hanging shafting with this method over the old method.



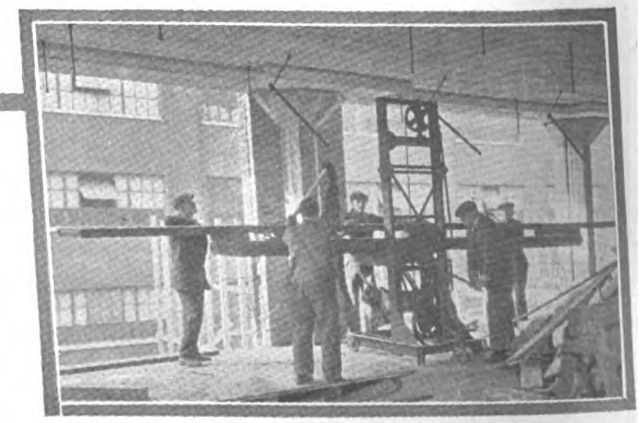
Placing motors overhead is a difficult job with the old rigging gang, but 2 men can easily accomplish this job in half the time after the motor is placed on the—?—platform. The section between the hinges is removable so that the same machine can operate under different ceiling heights.



This machine is equipped with special platform arms and container cradle. The dumping of the barrel or drum into a kettle or vat is accomplished by turning the crank of the small hand winch located at the side of the machine on the uprights. Chemical plants can use this attachment to advantage.



Increasing the field of the tiering machine by calling it a portable elevator caused this user to save money and time in loading trucks. (With a standard electric—?—)



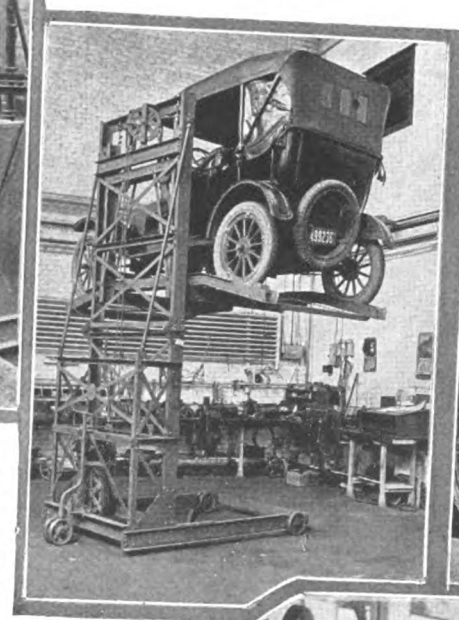
A standard tiering machine is adaptable in every line of work. This one has what is called an inverted platform, very useful in certain places.

Digitized by Google



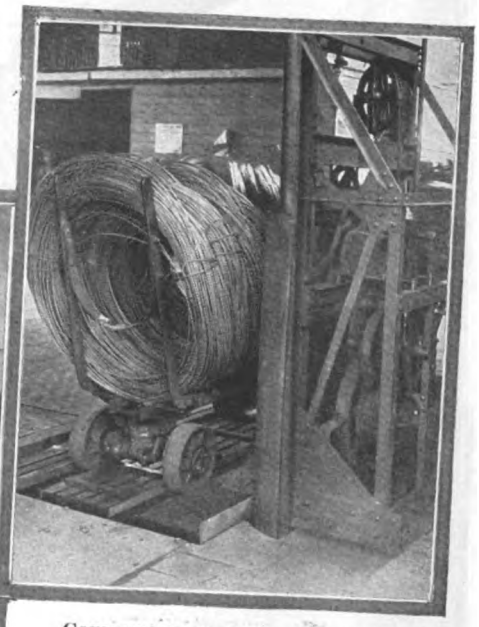
The United Materials Co. of Chicag saved the expense of building a car-loading platform by considering a standard tiering machine as a portable elevator and having it fitted with a special hinged platform, the overhanging portion of which works in and out of the car, automatically.

A special wide base machine built on the same design as a small standard machine is being used by the Hall Motor Company of Buffalo for elevating Ford cars so the mechanics can work under them.

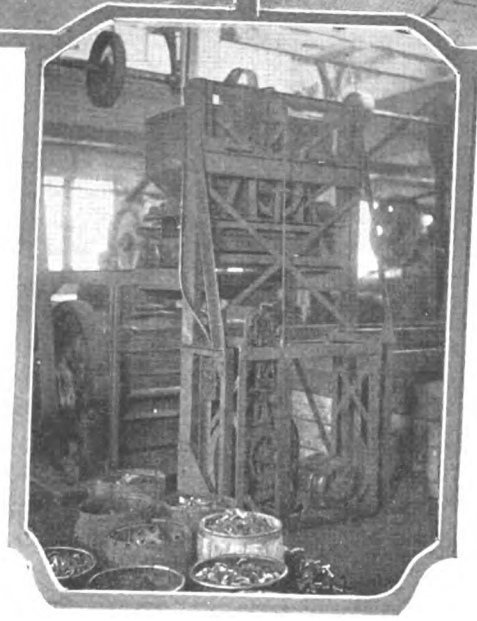




Machine built into an operatio i of the Interstate Iron & Steel Co. The machine platform lowers the truck of wire int a vat of water for the purpos of cooling and removing scal from the wire.



Companion picture. Formerly this wire was cooled by spreading the bundles on the floor of a large room and wetting them by means of the overhead sprinkler system, this required a large amount of space and made it difficult to handle the various bundles. It was also slow and expensive.



The installation of this machine in the plant of the Boss Nut Co. has increased the capacity of the tumbling barrels 75% and the work is done now by 1 man instead of 6.

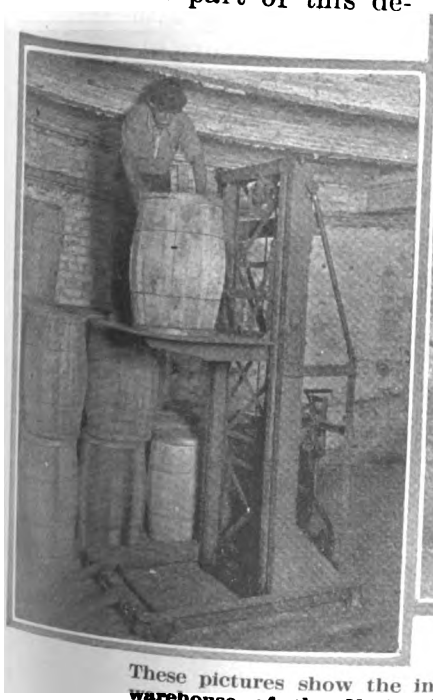
brought forward by the manufacturers and this equipment has been so consistently advertised as a piling machine that a number of engineers have overlooked its adaptability to operations other than piling.

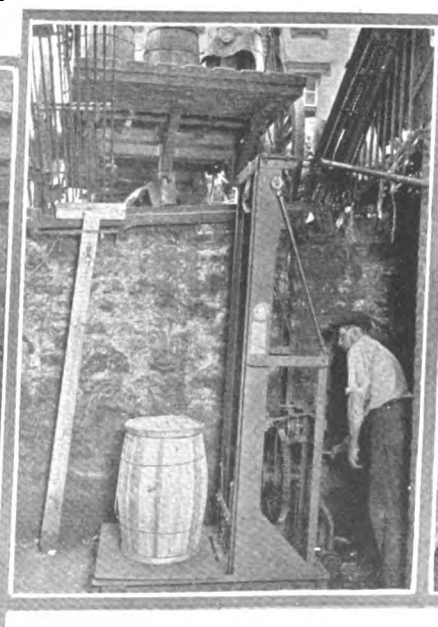
Referring to the Material Handling Cyclopedia, a book compiled by engineers, we find in the definition section the following: *"Tiering machine. A machine by which heavy packages are raised vertically to an elevation on a moving platform and then rolled or slid off on to the top of a pile or to an elevated rack; also called a portable elevator."* Now the last part of this definition should be first, because then the prospect or user of this type of equipment would immediately get the broad scope of work that could be performed.

I firmly believe that the name "PORTABLE ELEVATOR" fits this equipment better than the name "TIERING MACHINE," and to show the readers why this is true we include photographs of the equipment piling materials and also operating on work far removed from piling.

Today every plant manager and plant engineer is trying to find new uses for existing

(*Continued on page 56*)







These pictures show the installation of a new model of —?— or—?— in the warehouse of the National Tile Co., New York, N. Y. This machine is a standard hand-power, telescoping upright and is the latest development in the design of this type of equipment. At the left the machine is operating with the uprights at their minimum height and on an operation of piling; the center view shows the machine at its minimum height but in a different position and ready to be used as a sidewalk elevator; the third view shows the machine with the uprights telescoped and the platform raised to the bed of the wagon for loading the barrel. The minimum height of this machine is 7′ 10″ and the maximum height is 12′ 11″.

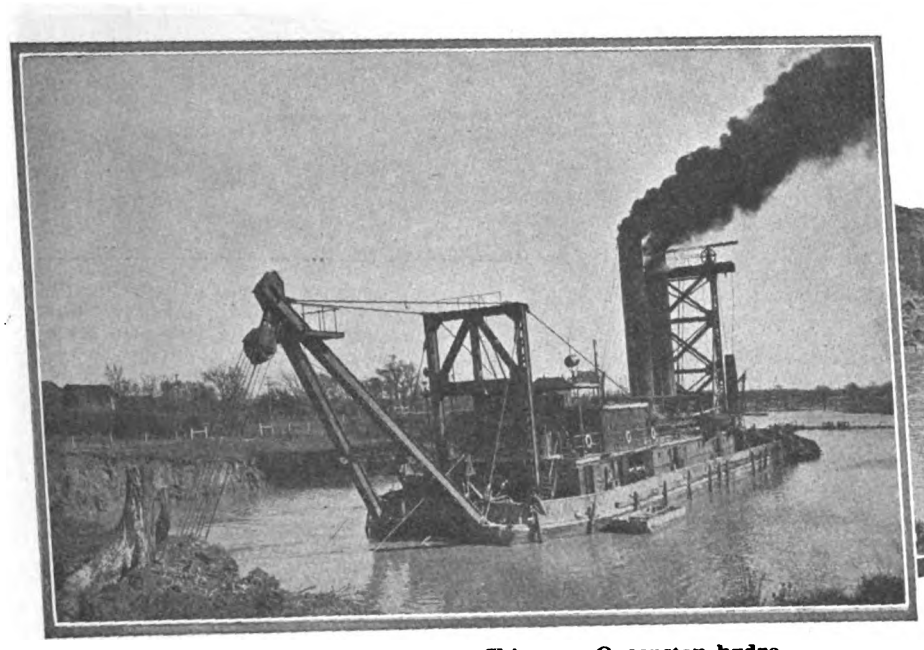


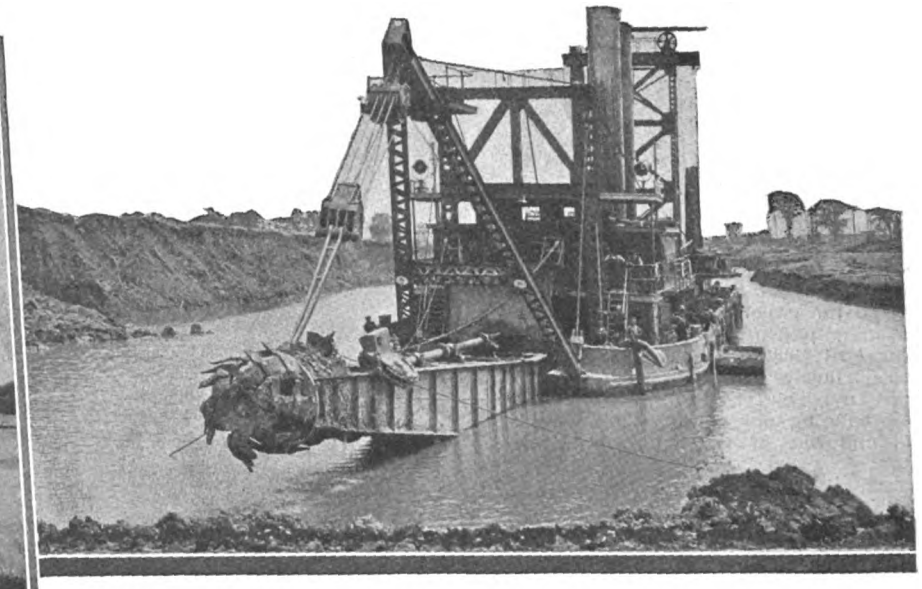
A telescoping hand-power machine used by the Museum of Natural History, New York, N. Y. This machine is 11′ 10″ minimum height, extending to 19′ 9″ maximum height and is used in the various rooms for all kinds of overhead work. The base is narrow, to go between cases, hence the outriggers.

Digitized by Google

New Canadian Power Development at Niagara

By J. F. Springer





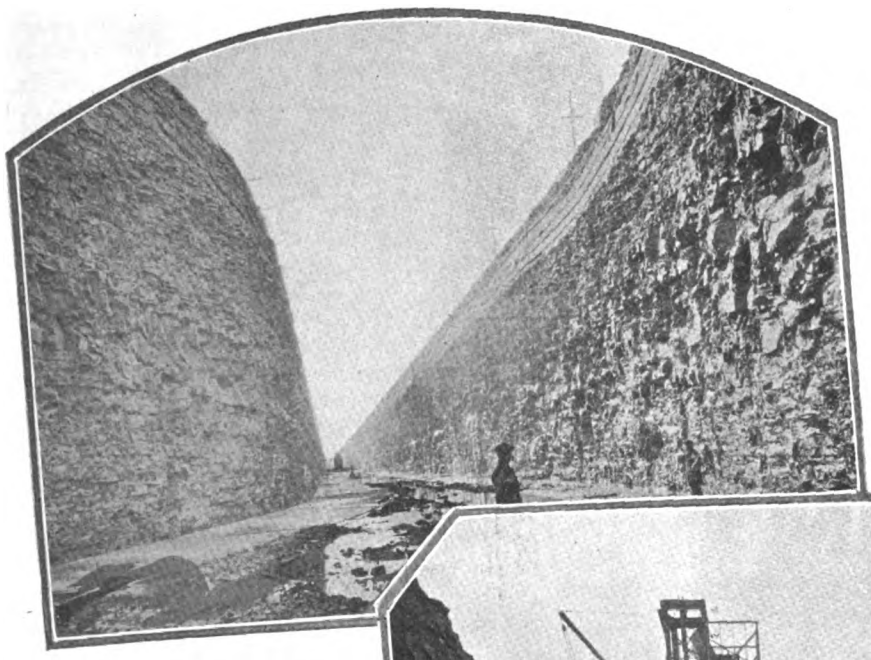
At right—Dredge working on Chippewa-Queenston hydro-electric enterprise. The cutting device is here shown above water.

Above—Same dredge with excavating device below water.

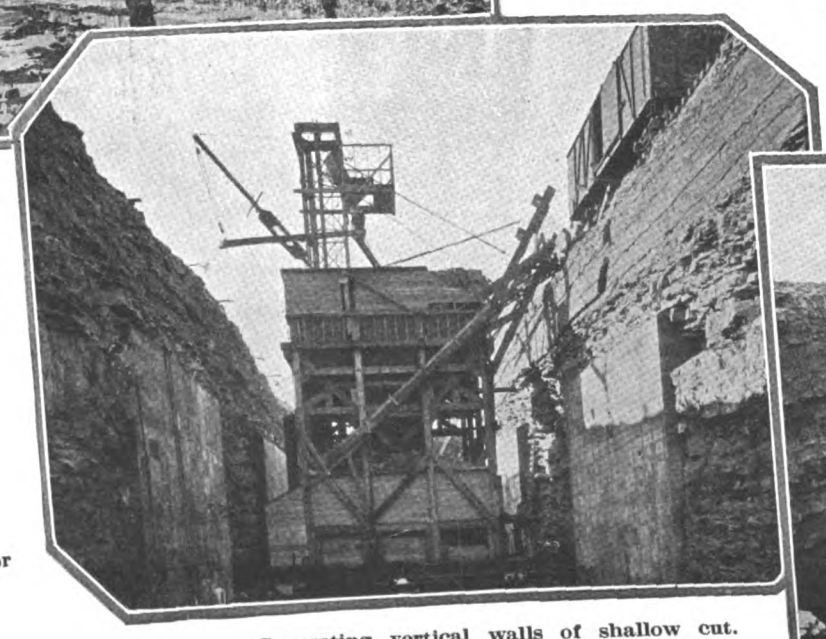
THE world has heard of a river diverted and the dry bed used as a means of entrance into a walled city; it has heard similarly of such diversion being utilized for the purpose of constructing engineering work; it has heard, too, of the voluntary disappearance of a river in the sands of a desert; and it has heard of a river being dammed and controlled for the purpose of converting its mechanical energy into electric current—but perhaps the first mention of a river reversed has been in connection with the great Canadian hydro-electric development at Niagara Falls. The Welland River flows from west to east in the region of country that lies between Lake Ontario on the north and Lake Erie on the south. Naturally at the end of the eastward flow, it empties into the Niagara River and its waters continue on north to tumble over the rocks at Niagara Falls. This Welland River is the stream which the engineers are reversing.

That is to say, the Canadians have, by an international agreement with the United States, the right to divert a certain amount of water naturally flowing over the Falls for the purpose of utilizing it in the generation of electric power. In accordance with this right, they are going ahead to withdraw water from

(*Continued on page 38*)



Deep cut in the 9-mile power canal connecting Welland River and fore-bay above power house at Queenston below Niagara Falls.



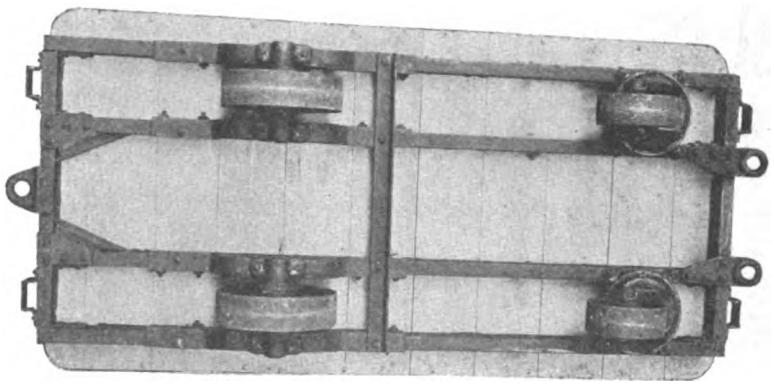
Concreting rig in cut for power canal.

Concreting vertical walls of shallow cut.



Digitized by Google

Trailer Trucks for Shipping



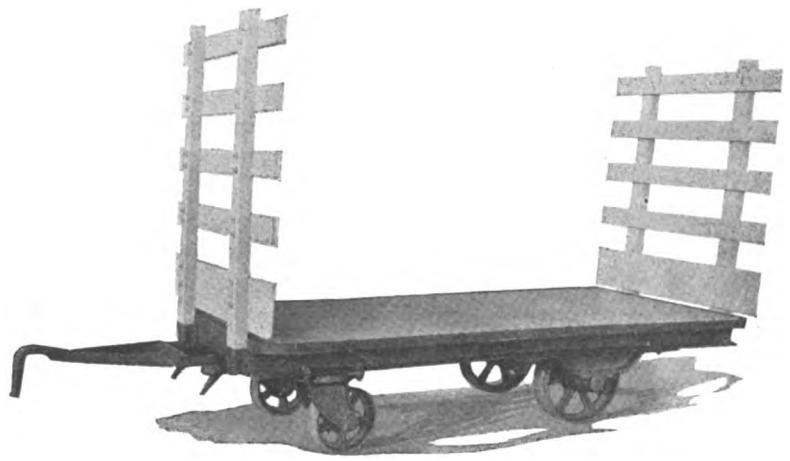
THE "K & J" Trailer Truck is designed with foresight and efficiency for handling material. It is especially adaptable to Dock work where constant handling of large units requires a trailer of special design to withstand the constant strain and usage.

A feature of this design is the individual axle construction on the rear wheels which affords a proper distribution of load on every member of the truck frame. The front wheels have an extra large caster plate and machined ball races. The radical load being on steel balls in fork head race is consequently carried over center of caster wheel axle, a condition required and yet not found in a caster plate of small diameter. This assemble swivels on roller bearings on bearing brackets around a king pin of proper length.

This is just one of the many "K & J" Trailer Trucks designed for economical operation in handling material on truck trains.

Hyatt Roller Bearings are Standard Equipment on all "K & J" Trailer Trucks.

Write for Bulletin No. 510



4,000 Lbs. Capacity

The Kilbourne & Jacobs Mfg. Co.

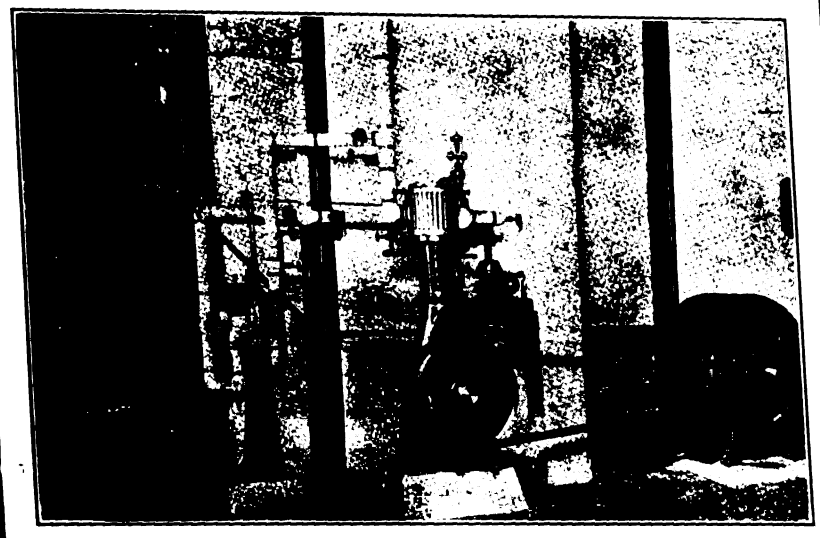
COLUMBUS, OHIO, U. S. A.

New York, 120 Broadway

Digitized by Google

TROY ENGINES

ONLY STEAM ENGINES GOOD ENGINES ONLY



In the boiler room of the Colorado National Bank Building, Denver

Highest Efficiency in the Smallest Space

The unusually High Efficiency of Troy Engines is evident in the many installations of which the above is an example.

Here a Troy Engine is driving a small high speed fan which furnishes forced draft to the boiler. Typical of all Troy Engine installations it means quiet, dependable delivery of power at the lowest cost of maintenance and minimum steam consumption—the result of 32 years' experience in developing an *efficient small steam engine.*

The many refinements in Troy Engine design make this possible—the rugged construction, compact and symmetrical—the self oiling feature—and the balanced valve, which is leakless and practically indestructible.

The balanced valve in all Troy Engines remains steam tight and sealed for years. This valve avoids the expense of renewing bushings and valves and prevents breakdown. It automatically clears the cylinder of condensation, making Troy Engines *exceedingly safe* under any and all operating conditions.

The Troy catalog will help you in deciding on the proper steam engine for driving fans, stokers and auxiliary apparatus. Send for a copy.

Write for the Troy Catalog

TROY ENGINE & MACHINE CO.,
TROY, PENNSYLVANIA

Transporting Coal from Mine to Waterfront

(*Continued from page 23*)

The coal is simply overlaid with a few feet of earth, so that the mining operations consist simply in taking off the cover and then getting out the coal.

What is often, if not generally, absent, particularly in the case of bituminous mines, is an adequate means of storage.

The coal goes into railroad cars at once. If there are no empty cars available, the mine shuts down until the railroad is able or willing to furnish them. This is ideal when everything works just right—when empty care are obtainable at the precise rate at which the mine should be worked. There is no extra handling. when coal goes into storage, there are two operations that will have to be taken into account. The coal must be delivered into storage, and later it must be reclaimed. Naturally, these operations cost money; and, while one of them may be regarded as more or less balanced by the fact that under the other conditions the coal must be delivered to the railroad cars anyway, there remains at least one operation. Not only must money be spent for extra handling but space must be found for storage and perhaps elaborate equipment. with which to do the handling.

But everything has to work just right if the coal mine is to operate without storage facilities. If there is a strike on the railroad; if other freight movements interfere with the regular operation of just so many coal cars, whether going away or coming back; or if the coal is not wanted at the destinations in stream of unvarying size winter and summer— if any of these things supervene, then trouble results and the mine shuts down in part or altogether.

What should be, are storage facilities at both terminals. Then the coal could be mined regularly throughout the year. Irregularities in transportation and consumption can be smoothed out in no other way. There should be no periods of threatened coal shortage. A certain amount of money would necessarily have to be spent to provide the storage yards and to operate them. And coal stored in them would mean a certain amount of capital tied up. All the same, there would be such perfection of mine operation possible and such perfection of supply, that the money benefit would probably far exceed the money disadvantage. Storage is the enemy of strikes and shut-downs, whether in the coal fields or in the consuming regions.

Coal once on the railroad car is theoretically coal on the way to the consumer. The car, however, is often a place of storage. It is not always, by any means that the loaded car proceeds without interruption or delay to the final destination and there is at once discharged. Too often the car with its load is held on a siding while other cars pass on the main track. Too often, the car of coal stands on some track at the terminal point waiting the deferred moment of discharge. As an "empty" going back, there also may be delays. These affect mine operation because at the mine there may be right at that moment a shortage of cars.

When there are full and complete facilities for storage at both terminals, we may expect very extensive reductions of present coal troubles. Until such facilities are created, we may expect trouble. Even if we turn to the system by which all coal will be burnt at the mine and made to operate steam-electric plants and by which the current will be transmitted to the points where power, heat and light are wanted—even if we turn to this system, we will need storage at the mines, for the reason that the current will almost certainly need to be used at once because of economic reasons.

The railroad coal car in the United States is ordinarily a considerable affair, carrying anywhere from 40 tons to 100 tons of coal. Naturally, they vary in width, length and height, though not in the gage of track on which the trucks run. Some of the cars of older type have fixed bottoms; but this is not the case with the up

Digitized by Google

to-date, modern steel car. It discharges, automatically through the bottom, gravitation doing the work at the moment. The alternatives are hand discharge by means of shovels; grabbucket unloading; and the almost complete overturn of the loaded car. The car with an end-gate is confined pretty closely, I believe, to foreign countries.

Hand discharge is still in use, and may be expected to continue in use, because so many consumers and dealers are unequipped and will remain unequipped with suitable facilities.

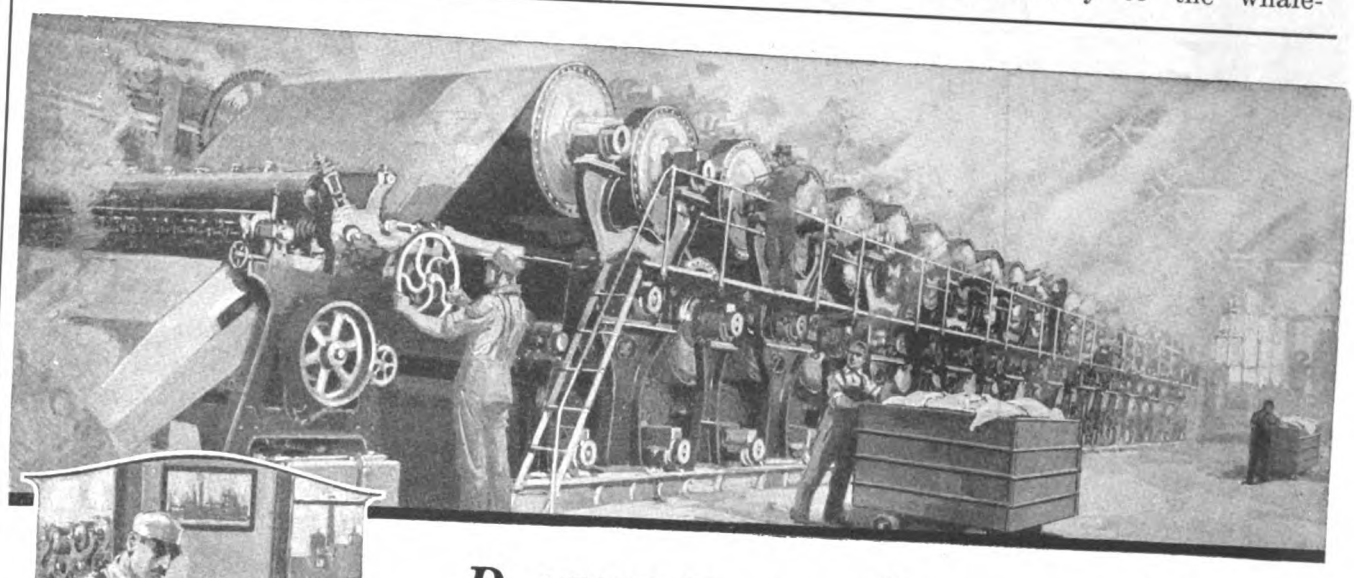
Usual methods of unloading coal make use of trestle-work and locomotive cranes. The loaded car or cars are run on a siding consisting in part of a trestle or other structure having space underneath. The bottom-dump cars are readily discharged. Cars with fixed bottoms may be unloaded by means of grab buckets operated by locomotive cranes.

The grab bucket is well suited to this work, particularly the variety of bucket known as the clam-shell. The coal is not unduly broken up and good time can be made. However, the grab bucket can hardly clean up and take away the last of the coal. The ordinary showel may be used for this purpose.

Where the coal to be unloaded runs into large amounts daily, the mechanical apparatus known as the car dumper is one of the most effective means in use. As its name suggests, this machine picks up the car together with its load and overturns the whole. The car is overturned sideways and the amount of rotation may be as high as 160°. That is, the overturn may come within 20° of being complete. In England, it is customary with corresponding machines to tilt the car endwise and allow the coal to slide out at the end, an end gate having been previously removed. The slant of the bottom along which the coal slides may be 70°—that is, within 20° of the vertical. By the American system, the surface that is at 70° is the side of the car, and the length of the slide is at most from the bottom to the top edge of the side. There can be no doubt that the American method gets the coal out of the car much more quickly. In England, the car is tipped; in the United States, it is overturned. However, they make good time abroad. Their system would not be very suitable here, largely because it requires all cars to have end-gates.

The American car dumper handles cars of miscellaneous character—broad cars, narrow cars, tall cars, low cars, long cars, short cars. Naturally, the machine that handles them must be capable of much adaptation. In fact, the car dumper is a rather wonderful affair. Let me give some details.

The car dumper is used in such situations as a railroad water-front where large quantities of coal are to be delivered from railroad cars to storage spaces on board barges and ships. In some cases, as at New Jersey terminals on the water-front belonging to New York Harbor, the coal which flows into the apron of the car dumper from the overturned car finds its way at once into the barge moved alongside the tower of the machine. Similarly, at certain ports on Lake Erie, the car dumpers deliver directly to the whale-





In the manufacture of paper, huge clouds of steam arise from the heated rolls of the machine, and condense upon striking the roof and steel superstructure of the building. This moisture drips back on the newly formed sheet resulting in stains and weak spots which cause the sheet to break, effecting serious losses by interrupting production until the machine can be rethreaded. Being subjected to this dampness continually, also causes the roof to rot very quickly.

Arex Original Siphonage Ventilators correct this condition by rapidly exhausting the steam before it has time to condense. Because of their low first cost, and absence of operating expense, the savings they effect quickly pay for their cost of installation. Some typical Arex installations in paper and pulp mills are.

Northwest Paper Company
Whiting Plover Paper Company
Gilbert Paper Company
The Ohio Paper Company
Flambeau Paper Company
John Strange Paper Company
Lakeside Paper Company
Appleton Coated Paper Company
Harding Paper Company
B. D. Rising Paper Company
Aetna Paper Company
Chemical Paper Mfg. Company
Certainteed Products Company
Pilkington Bros.

Send rough sketch or blue print of building with data for engineer's analysis

Put YOUR *ventilation problem before this board of specialists*

FOR more than fifteen years, Arex engineers, specialists in industrial ventilation, have been freeing manufacturing properties of profit destroying conditions.

Steam, heat, smoke, fumes, foul air—every conceivable situation has been under their surveillance.

They have made foundries, paper mills, warehouses, garages, machine shops, textile mills, power stations and scores of other industrial buildings more profitable investments by correcting air conditions therein.

They have counselled with the executives of every industry and can tell you immediately because of this vast experience, an inexpensive and positive solution for any ventilation problem in your plant.

Use the specification blank below to bring you this information without cost or obligation. Attach a rough sketch or blue print of the building. Address Arex Company, Engineering Division 1583 Conway Building, Chicago.

AREX COMPANY

J. C. Kernchen, Pres.

INDUSTRIAL VENTILATING ENGINEERS

Arex Ventilation Engineering Survey SPECIFICATION BLANK

We desire to receive *Gratis* an engineer's analysis of the following building: ..... *State character of work or business building is used for*

We are troubled with: Fumes ☐ Smoke ☐ Foul Air ☐ Heat ☐ Condensation ☐ Steam ☐

Dimensions of Building: Width.....Ft. Length.....Ft. Ceiling Height.....Ft.

Construction of Building: State whether Brick ☐ Concrete ☐ Frame ☐ Stucco ☐

Type of Roof: State whether Flat ☐ Slant ☐ Gable ☐ Sawtooth ☐ Monitor ☐

Pitch of Roof..... State how many..... inches to the foot.....

Location of Floor or Room to be ventilated.....

How high do adjoining Buildings extend over your Roof?.....

How many feet distant are the surrounding Buildings, or is your Building entirely unsurrounded? .....

....
Firm Name Name of Individual Title of Individual

....
Street Address City State

Digitized by Google

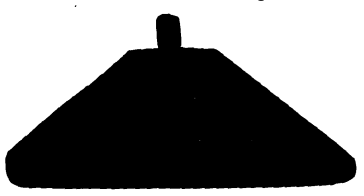
THE LAY BROOM

Honestly Made



Fully Guaranteed

Standard for Forty Years



STANDARDIZE And ECONOMIZE

You require that the lathe or other machine which you buy be developed along engineering principles. It would not otherwise be efficient. *Why not require the same of a Broom?* Every Lay Broom reflects the specialized, *technical knowledge* of Forty Six Years of good broom making. So that today our product has been Standardized by large industries throughout the country.

The Lay Stapled Metal Case Broom may look like other brooms but the *unseen factors* of Three Generations of specialization in Factory Brooms spell Economy, Efficiency and Faithful Service.

CUT YOUR SWEEPING EXPENSE IN TWO

The Lay Stapled Metal Case Brooms are made of the best materials the market affords and are *scientifically designed* and *constructed*. As a result they will do twice the sweeping possible with an ordinary broom and will do it better and faster.

YOU RUN NC RISK

Performance records prove their great economy. Every Broom unconditionally guaranteed.

You, too, can enjoy a surprising economy in your sweeping expense by using Lay Brooms. Send us *your orders* now and reduce your 1923 sweeping expense.

LET US SUPPLY YOUR BROOMS.

Push Brooms Metal Case Brooms Casting Brushes
Bench Brushes Flue Brushes Hickory Fibre

If it's a Broom we make it and make it right.

THE JOSEPH LAY CO., Inc.
120 College Street
Ridgeville Indiana

Originators of the Metal Case Broom.

© The Joseph Lay Co., 1923.

backs or other ships operating on the Great Lakes.

The car dumper may, however, be only a link in the actual transfer of coal from railroad to barge and ship. Thus, in the Hampton Roads district, on the Atlantic Seaboard, there are several very tall coal piers on whose elevated decks no railroad car runs. Big, special pier cars transfer coal from the land end out to points on the pier. These cars receive from the car dumper which is located on the shore near the land end of the pier structure. The special car operating under its own power, may require the loads of two railroad cars to fill it. When ready, it will, in a representative case, run the short distance from the dumper to a pier elevator. Here it is elevated together with its load, to the deck. It may then run under its own power to a destination out on the pier. Arrived here, it may discharge, through its bottom, to a coal pocket constructed in the pier structure underneath the track. Such pockets serve as temporary storage receptacles. The ship alongside the pier receives from the pocket *via* chute.

Some of the piers have decks about 90 feet above the water. Naturally, the expense of constructing such enormous affairs as these piers is tremendous. They are built tall in order to provide for gravity movement of the coal from car to pocket and from pocket to the highest hatch on the highest ship coming to the pier. Such ships, if the cargo of coal to be received is large, stand high above the water. If the ships are broad, then the height of the pocket must still be sufficient to carry the coal outboard a goodly distance as well as be above the highest hatch. Ninety and 70 feet seem to have covered the requirements at Hampton Roads.

At the New Curtis Bay pier in Baltimore Harbor, the car dumper is employed also in the way of a link in the chain of delivery. However, the car dumper does not deliver to pier cars but to a pier conveying belt. The delivery from the car dumper may be more or less indirect. The coal once on the belt is carried out into the pier. This is a long, low affair. Delivery from the pier to the ship is accomplished by

Keeps His Eye on The Score

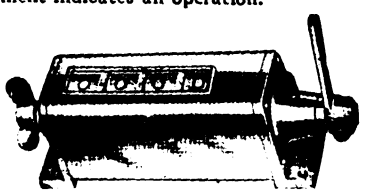
Any game a man plays, his eye is on the score. It's the same when he's operating a machine.

On the machine a Veeder Counter keeps the score. And your worker keeps his eye on it.

Maybe he's trying to *better* his record—at producing. Maybe he's only watching out to prevent a *poor* showing. In either case, his production is *HIGHER* because of a

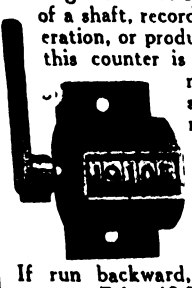
Veeder COUNTER

The Set-Back Rotary Ratchet Counter below is for machines such as presses and metal-stamping machines, where a *reciprocating* movement indicates an operation.

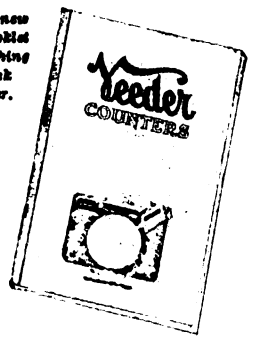


Registers one for each throw of the lever, and sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price, with four figures, as illustrated, $11.50—subject to discount. (*Cut less than ½ size.*) Set-back *Revolution* Counter of similar model, $10.00 (list.)

The small Revolution Counter below registers one for a revolution of a shaft, recording a machine operation, or product. Though small, this counter is very durable; its mechanism will stand a very high rate of speed, making it especially suitable for light, fast-running machines, and most adaptable for experimental work. If run backward, the counter subtracts. Price $2.00. (*Cut 3/5 size.*) Small Rotary Ratchet Counter, to register reciprocating movements of small machines, also $2.00.



FREE—This new 80-page booklet shows everything you could ask in a counter. Ask for IT.



The Veeder Mfg. Co.
63 Sargeant St., Hartford, Conn.

Digitized by Google

power and not merely by elevation above the level of the hatches. At another port on the Southern Atlantic Seaboard (Charleston, S. C.), a somewhat similar conception has been put into effect. The idea is to get rid of the tremendous outlay required for a very tall pier.

There are a very goodly number of coal piers along the Atlantic coast which are of such types as to utilize the modern car dumper either not at all or only to a very small extent. Philadelphia and New York Harbors contain quite a number of the older types. They are wooden affairs and usually have no great height. They may, however, be considerable structures because of the length. Gravity delivery to the barges and colliers is largely depended upon. The railroad car goes out upon the deck of these piers. The movement of the cars to the decks is often, perhaps generally, accomplished by gravity. That is, the decks dip slightly toward the sea, although it is possible to have them dipped in the opposite direction. In the latter case, a locomotive is required to get the cars out on the pier, although this is not to be interpreted as necessarily meaning that the locomotive itself needs to go onto the pier deck.

It is very customary to use gravity as the means of shifting empty cars from a pier back to tracks on the land. This may be done in connection with car dumpers, especially in cases where the dumper delivers directly to vessels alongside the dumper tower.

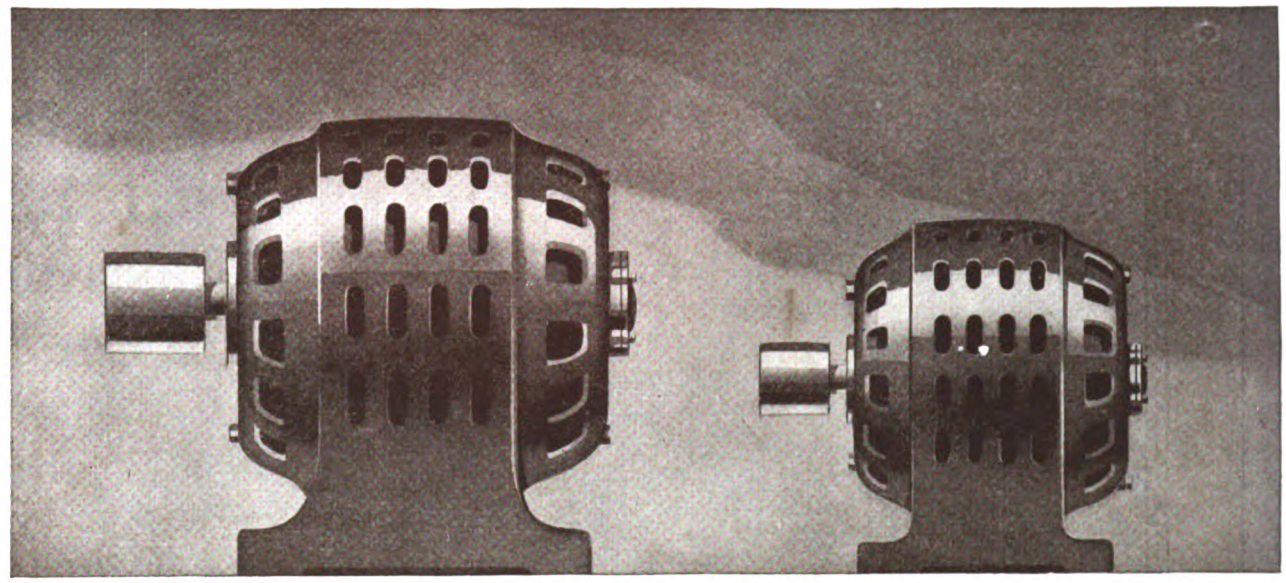
Coal delivered from rail to boat at New York has several destinations. It may go onto towed barges and then be moved to coal yards on the water-front, power-plants similarly situated, or to storage yards. It may also be delivered to sea-going colliers and barges for transportation to New England points. The New York Edison Company maintains a big storage yard and plant at Shadyside on the New Jersey bank of the Hudson River. Here coal is received by barge from railroad terminals located on New York Harbor, but further south. This coal is destined, perhaps all of it, to be consumed at Waterside power-plant, located on the *eastern* side of Manhattan, and so must be transported thither by barge. They can at Shadyside store enough coal to last anywhere from 6 months to a year. This is an example of what should be a more general adjunct to the plants of big consumers. This storage yard is equipped with its own elevated tramway for the automatic transportation of coal between the water-front and the storage regions of the yard. Coal dumped from the tram cars is, if necessary, piled at points nearby, by the grab bucket and locomotive crane method.

Let us return, however, to the car dumper. The reader may be interested in nothing the main features of operation. Consider a typical case.

The coal comes into the vicinity of the dumper, loaded on railroad cars. These may vary a great deal in size and shape. There will be a loaded yard. This consists of a lot of side tracks where loaded cars may be held. The tracks will

(*Continued on page 33*)

Made Under SKF Supervision



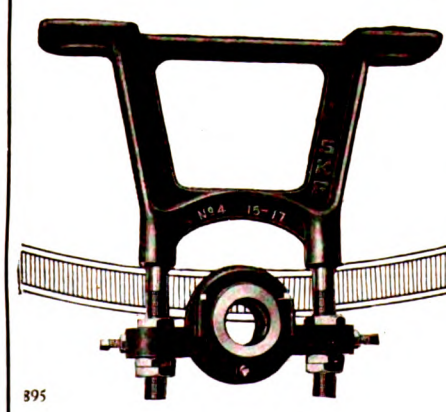
Making 6500 Kilowatt-Hours do the Work of 10,400

A SHOP equipped with plain-bearing hangers on its line-shafting consumed 10,400 K.W.-hours per month with a maximum demand of 75 K.W. A changeover to Skayef self-aligning ball bearing equipment was made and it was found that only 6500 K.W.-hours per month were required to do the same work and that the maximum demand dropped to 39.9 K.W. This saving in power consumption with ball bearing equipment reduced the yearly cost of power from $4992 to $4173 — a saving of $819 or 19.4 per-cent. This saving is typical of what one may expect from a changeover to self-aligning ball bearing line-shaft equipment.

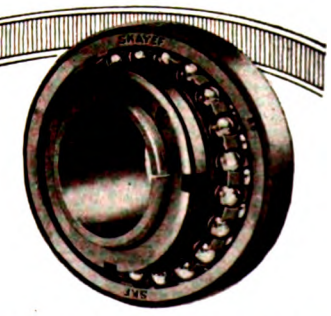
The reduced power consumption is primarily due to the SKF marked self-aligning ball bearings used in Skayef hanger equipment. These bearings have two rows of highly polished steel balls operating between hardened races of steel, the inner race, balls and retainer being free to turn within the outer race like a ball and socket joint. This makes the bearing practically frictionless and immune from appreciable wear, not only when well aligned but also under conditions of misalignment that are so likely to occur in line shafting.

May our engineers give you an estimate on the saving which ball bearing equipment will effect for you, and make definite recommendations for a changeover.

Stock-Carrying Agents in All Principal Cities



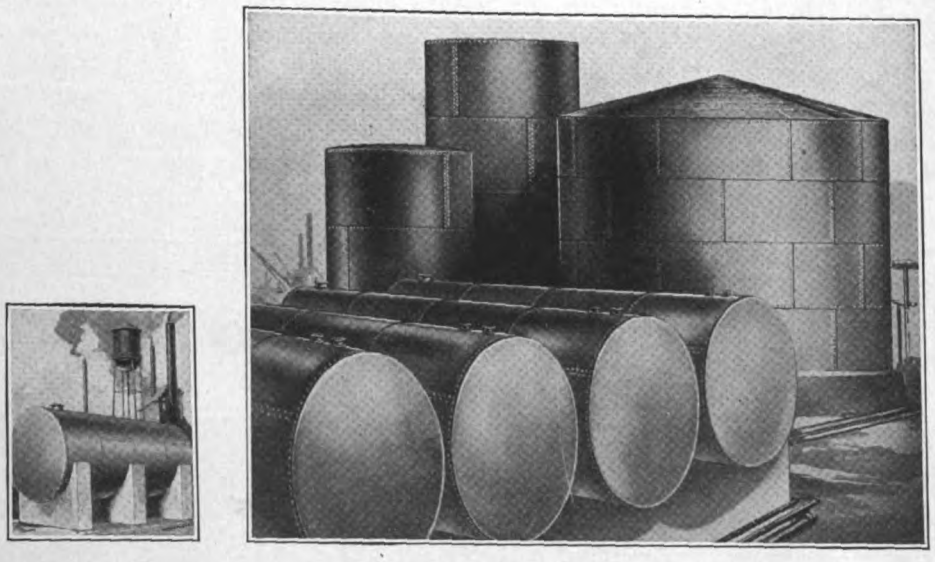
SKAYEF Self-Aligning Ball Bearing HANGERS (IMPROVED TYPE)



THE SKAYEF BALL BEARING COMPANY
165 Broadway New York City

895

Digitized by Google





Making The Product Worth Its Cost: The Fisher Mark On A Custom Body The Lancaster Name Plate On A Tank

The name of the maker means a lot to the prudent, far-seeing buyer who figures costs per years of service rather than comparative first cost. ¶ The Lancaster Name Plate on a Tank is your guarantee of long life and insurance against costly evaporation loss. ¶ Behind this name plate is an organization that *knows how* to make the product worth all it costs

Our Service Department has compiled three books of great practical value to all users, or prospective users, of Tanks. BOOK B-1 *gives List Prices and Specifications on* 303 *sizes of Horizontal Storage Tanks from* 100 *to* 25,000 ***Gallons*** *capacity. BOOK* B-2 *tells about Storage Tanks from* 1,000 *to* 74,000 ***Barrels*** *capacity. BOOK* B-3 *gives List Prices and Specifications of* 134 *Standard Sizes of Pressure Tanks. Any or all of these three valuable books sent free upon request.*

LANCASTER IRON WORKS

New York Office
501 Fifth Ave.

LANCASTER, PA.

Philadelphia, Pa.
Wesley Building

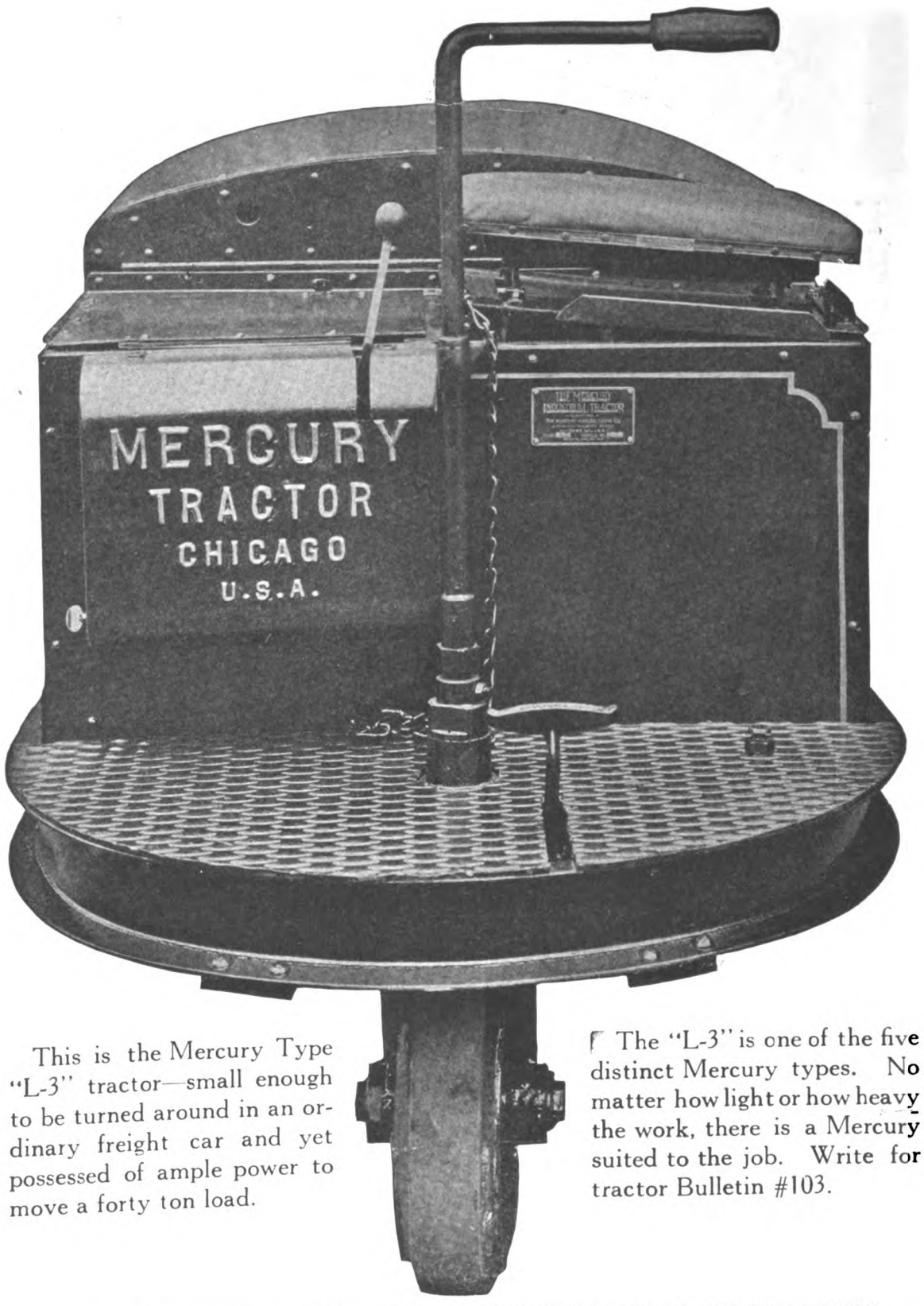
Digitized by Google

(Continued from page 31)

be downgrade in the direction of the site of the dumper. A man will get up on one in a leading position, loosen the brakes and let the car go. As the car nears the dumper, the grade may drop down and up. The sharp down grade will serve to carry the car up the rise of the upgrade for a short distance. The upgrade tracks to the dumper will have a depressed narrow gage track between the rails on which the coal car is to travel up to the dumper. A small car, operated by cable, runs up and down on this narrow gage track. Its duty is to get behind a loaded coal car and push it up the incline. When it has pushed a car up to and onto the cradle of the dumper, it has performed its proper service and then returns to a position near the bottom of the incline and back of a new loaded car which has started up the hill. There are two methods of getting the little car—called a "ground hog," a "barney" or a "mule"—back to initial position. One is to let it run back under the influence of gravitation. But this method is, it appears, now becoming too slow to meet the requirements of certain plants; so the cable is used to bring the car back as well as take it up.

The new car coming up to the cradle should arrive just in time to shove forward the preceding car, now empty and on the cradle. The "empty" runs down a sharp declivity and immediately up against a "kick-back," the result of which is to send it on its way down and back to the general level where it will eventually arrive in the "empty" yard. Gravitation does all of this.

The loaded car which has just pushed an "empty" from the dumper cradle is now hoisted, the cradle serving as elevator car, until the predetermined point for overturning has been reached. The cradle is L-shaped in section cutting across the car. The loaded car does not stand directly on the platform formed by the base of the L, but on a movable platform resting on the base. On top of the movable platform is a short length of railroad track. Underneath, it is provided with wheels or rolls, and these run on the base of the L. When the car gets under way on the upward movement, the movable platform shifts so as to cause the side of the coal car to abut against the vertical wall or side of the cradle. The object here is to get ready for the overturning movement, which will be a partial rotation in the direction from the car to the side of the cradle. If a space of several inches were left until the overturn, there would be a shock when the load came against this part of the cradle structure. The loaded car is kept from falling out of the cradle during the overturn by means of wire ropes arranged vertically in front of the dumper tower. These are not permitted to come into immediate contact with the top edges of the coal car. That is to say, as the car is hoisted, it encounters several L-shaped bars, only the L is inverted. There is in fact a vertical part which extends downward from a point between the ropes and the car and also a horizontal part which extends over the top of the car. This horizontal part



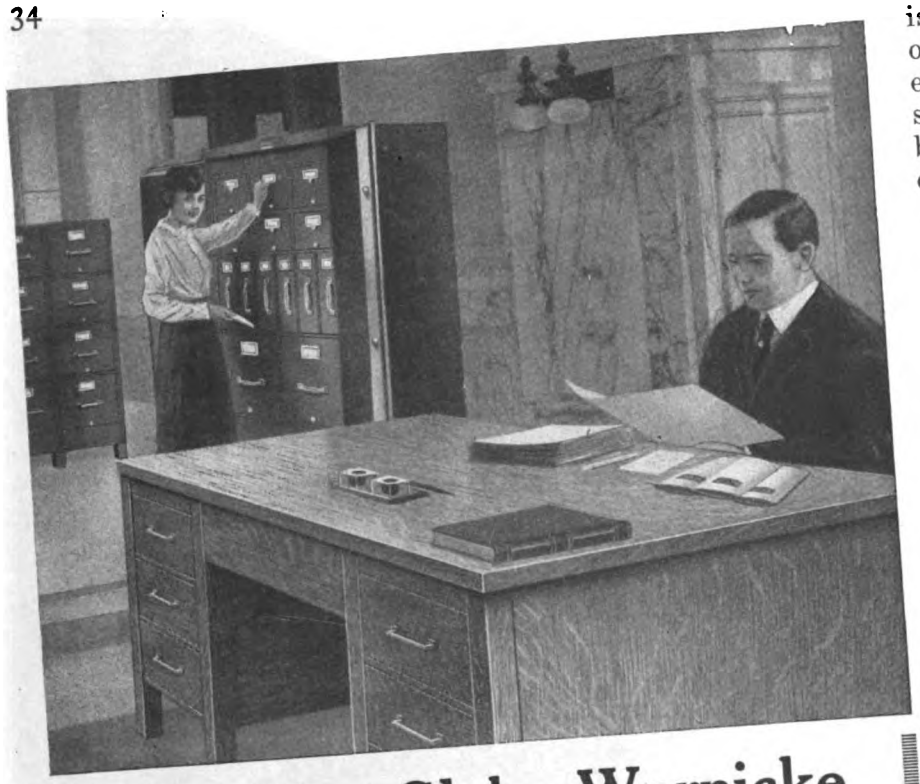
This is the Mercury Type "L-3" tractor—small enough to be turned around in an ordinary freight car and yet possessed of ample power to move a forty ton load.

The "L-3" is one of the five distinct Mercury types. No matter how light or how heavy the work, there is a Mercury suited to the job. Write for tractor Bulletin #103.

MERCURY MANUFACTURING COMPANY
4118 SOUTH HALSTED STREET CHICAGO U. S. A.

THE TRACKLESS TRAIN

Digitized by Google



There's a Globe-Wernicke Filing Cabinet and Structural Strength Safe for you

One to fit your every need. Learn what it is. These cabinets, wood or steel, with the Safeguard method of Filing will give you a perfect system which will help your business grow. We have helped others. Let us aid you.

The Globe-Wernicke Co.

DEPT: I: I: 82 CINCINNATI
Chicago

Boston
Cleveland
Washington
New Orleans

Detroit
St. Louis
New York
Philadelphai

Globe-Wernicke

BUILT TO ENDURE

SEND THIS COUPON

The Globe-Wernicke Co.
Dept. I.I. 82, Cincinnati, Ohio
Please send us free your books on Filing Cabinets and Safes.

Name.....

Address.....

is grooved on top. When the overturn occurs, this groove engages a rope. As there are several ropes and L-shaped bars arranged along the length of the car, the result is that the ropes resist the weight which increases as the overturn continues. When the coal has all flowed out, the car, "cradle and all," are rotated back and let down to the initial position.

The Man Who Converted a Bark into a Bite

(*Continued from page 17*)

Hartford, can derive some satisfaction from the fact that at least it is they who make and sell most of Browning's guns, even if they did not originate them.

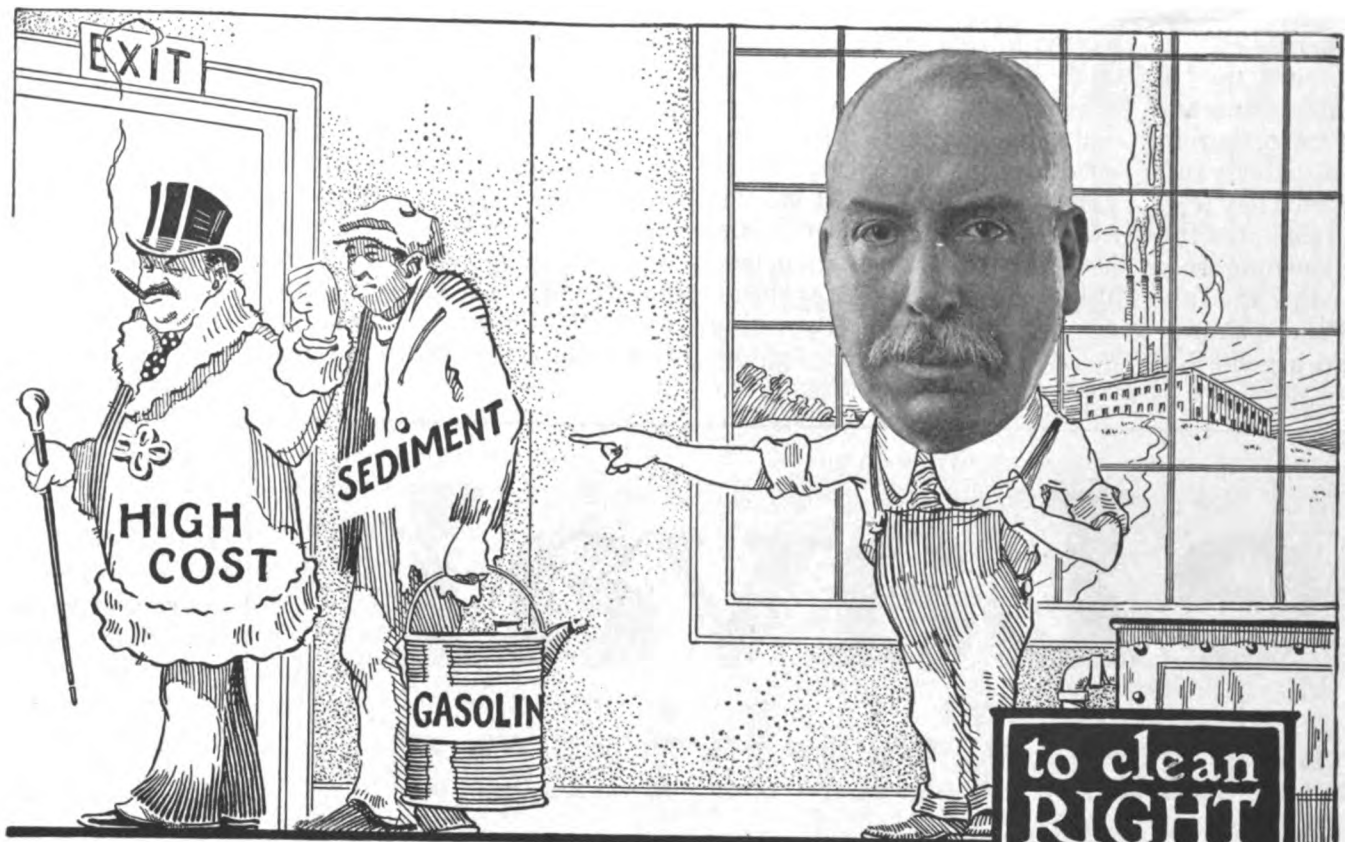
His first patent was granted in 1880 on a breech-loading rifle. He and his brothers made six hundred of them in their Ogden shop, and then Winchester bought the manufacturing rights. Since then he has developed most of their models. Remington acquired his auto-loading shot-gun and rifle. Stevens got his 12-gage repeating shot gun. He is responsible for all the well-known Colt automatic pistols. His pump gun has been mentioned. Whatever weapon Browning produced was so thoroughly right that the remarkable statement is made that not one of them ever has been superseded, even by his own later inventions; every one still is being manufactured and used by sportsmen and soldiers. Belgium bought the manufacturing rights to one of his army rifles, and when its arsenals turned out the millionth piece, in 1914, King Albert celebrated by decorating Browning with the Order of Leopold. Three other European governments adopted this American's guns for the use of their armies.

A Matabele chieftain once told a British army officer, who had had no easy job defeating him, that he did not object to the gun that spoke once (the rifle) or the little one that spoke six times (the revolver), but he could not withstand "the gun that kept on talking like an old woman, and never stopped." That was the machine gun. It is not quite so new as we are apt to think. On March 15, 1718, one James Puckle, of London, ("Gent" of course!) was granted letters patent on "a portable gun or machine" made of steel, iron and brass, mounted on a tripod of wood and iron, and bearing a startling resemblance to the most modern weapon of that type. The Turk was not any better loved in those days than now. The English Church litany had something to say about him, and Puckle designed his gun to shoot "round bullets against Christians and *square* bullets against Turks"!

By 1890 the United States government had adopted the Colt (Browning) machine gun, automatically operated by its own gas discharge, along with the hand-cranked Gatling. Machine guns had been used to some extent in the Franco-Prussian War, and European soldiers were using them in their wars with natives in Africa and elsewhere. But it was Americans whose genius, combined on a memorable occasion, made the machine gun a new arm of military service and created an epoch of tactical science. When Colonel Roosevelt and his Rough Riders fought at Santiago, Lieutenant John Parker had a few machine guns, most of them the now obsolete Gatlings, with one or two Colts. They were regarded as weapons of defence entirely. But American soldiers have a way of not doing things that always have been done, and Parker was one of them. The Americans, blazing away, heard the rattle of what they supposed were the Spaniards' machine guns, on the defensive. But soon Col. Roosevelt jumped to his feet, slapped his thigh, and yelled with joy to his men, "By Godfrey, boys, it's Parker! it's our own guns!" And when the line rushed forward, what did

(*Continued on page 36*)

Digitized by Google



How JOHN BRIGHT rid the cleaning department of three pests

IN the pressed metal division of a large automobile plant, the cleaner which was being used to remove mineral oil before japanning and stocking was leaving a deposit of sediment on the work, causing much trouble.

After trying another cleaner which was entirely soluble in water, with slightly better results, it was found necessary to clean some of the work with gasoline. The soluble cleaner required ½ hour of boiling to remove the mineral oil and the solution cost 7½ cents a gallon.

Finally they sent for me to rid their cleaning department of these three pests—High Cost, Sediment and Gasoline. Now my cleaner is giving entire satisfaction. It cleans in SIX MINUTES and costs only 3 CENTS A GALLON.

No matter what you are cleaning or what cleaner you are using, one of our forty compounds will save you time and money and improve the quality of your work. Let me prove this by shipping you a trial of the proper International Cleaner to meet your particular needs. Simply write me what you are cleaning. I'll do the rest. Trial order will not cost you a cent unless it does all we claim for it. Write me TODAY.

Internationally Yours
John Bright

International Products
IC
International Chemical Co

INTERNATIONAL CHEMICAL CO.

PHILADELPHIA ~~~~~ PENNA.

Digitized by Google

(Continued from page 34)

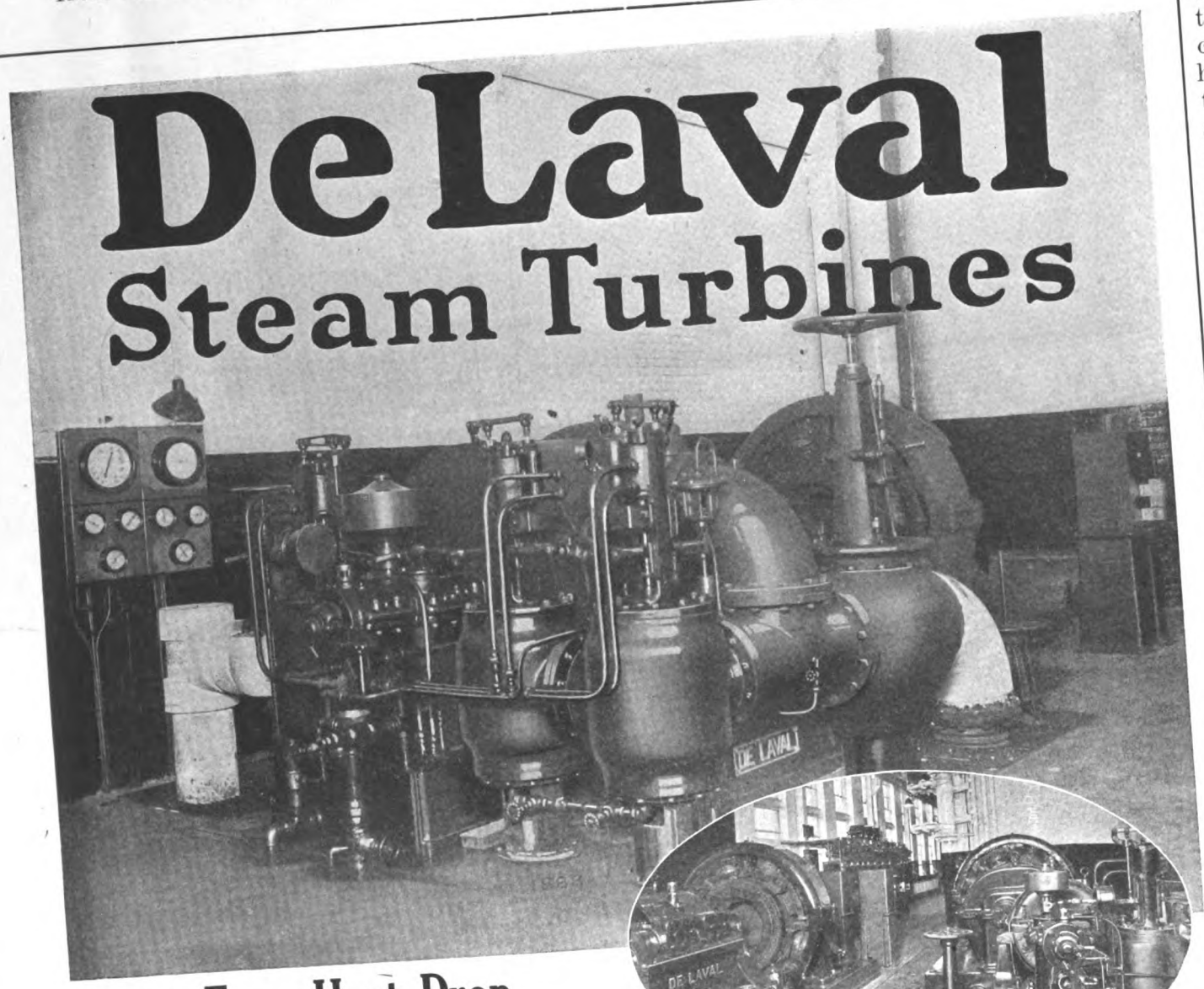
that young lieutenant do but pick up his machine guns and rush them forward, too, thereby converting them decisively into weapons of offense! They were heavy and cumbersome for this new duty, but Browning soon adapted them to it, and "Browning's Peacemakers," from then on, had a good deal to say, in more languages than one.

So when the Great War came on, machine guns were being used by all armies and for a variety of purposes in offense and defense. They would jam, however, at critical moments. When the United States decided to fight, John Browning decided that American fighters should have a weapon which would give them an advantage over the enemy, an arm that never would fail them. In a few months he had produced what the experts from the battlefields, when they attended its testing, pronounced "the finest machine gun in the world." Three of them, in fact: the light Browning machine rifle, weighing but fifteen pounds, carried by one man and fired from the shoulder or the hip; the Browning heavy machine gun, weighing, with its water jacket full, 34½ pounds; and the same gun, air cooled, for airplane use, weighing 22½ pounds, and firing through the propeller. Browning made a machine gun for the soldier to use under the conditions he met on the firing line, where there is no time for fussing with complications, and no repair shop handy. With fewer than twenty principal parts, it is taken apart and reassembled in less than five minutes and with no tools other than a small wrench and an empty cartridge shell. It operates on the power of the recoil. It ejects its discharged shell downwards, completely out of the way, instead of sidwise as other guns do, sometimes striking the next man in the face. No special ammunition is required; it uses the regular .30 caliber service cartridge, in a magazine of twenty or forty.

On February 27, 1918, the new gun had its test, under conditions more severe than it would ever meet in actual service, conditions which, as one officer said, would subject a soldier to court-martial if he ever permitted a gun to get into them. The barrels were corroded with acids, they had sharp dust, like emery, blown into them. They fired 20,000 shots with one, 39,500 with another, 20,000 with a third. One gun fired its stream of bullets for forty-eight minutes and eighteen seconds. And not once was there a jam. There were three stoppages, all due to the ammunition, and not to any failure of John Browning's mechanism to function.

Under the terrific strains of almost infinite energy in explosion and recoil, of changes in speed from absolute rest to the pace of lightning, of rapidity in the cycle of movements that makes "the twinkling of an eye" ridiculously slow, metal and gunpowder are as tractable as clay in the hands of John M. Browning. As distinguished from the student, the scientist, the philosopher, the statesman, the captain of finance and industry, he is their equal in a distinct field: he is supremely the craftsman, the mechanician, the artificer.

De Laval
Steam Turbines



Power From Heat Drop Instead of Water Fall

POWER can be produced very cheaply in a De Laval turbo generator which also supplies steam for heating, drying or manufacturing processes.

The accompanying photographs show three 1,000 kw. De Laval direct current geared turbo generators recently built for a cloth finishing plant. Two of the units are of the straight non-condensing type, supplying steam for manufacturing processes and heating. The third unit is a combined mixed flow and bleeder turbine, and serves to establish a balance between the exhaust steam and the power requirements, as it can either receive from, or exhaust into, the low pressure mains, or receive live steam and exhaust, to the condenser, changing automatically in response to conditions.

Possibly our engineers can assist in improving the overall money economy of your plant by solving similar problems presented therein. De Laval steam turbines are of the velocity and pressure stage types, and are built in all sizes up to 15,000 hp., and for driving machinery at all speeds.

Ask for Catalog D-112

Other Products of the DeLaval Steam Turbine Co.

Descriptive literature will be sent upon request:

DeLaval Single Stage Turbine: For High Pressure Condensing and Non-condensing Service. All sizes below 400 HP. Catalog A.

DeLaval Pressure Stage Turbines: For High Pressure Condensing, Low Pressure, Mixed Flow, Non-condensing and Back Pressure Service. All sizes, 50 to 15,000 HP. Catalog D.

DeLaval Double Helical Gears: All sizes, for all speed ratios up to 25 to 1 in one step.

DeLaval Centrifugal Pumps: Horizontal and Vertical, Single and Multi-stage. For all Heads and Capacities. Catalog B.

DeLaval Centrifugal Blowers and Compressors: Single and Multi-Stage. For all pressures up to 125 lbs. Catalog F.

De Laval
Steam Turbine Company
Trenton, New Jersey

Atlanta, Birmingham, Boston, Charlotte, Chicago, Cleveland, Dallas, Denver, Duluth, Indianapolis, Kansas City, Los Angeles, Montreal, New York, New Orleans, Philadelphia, Pittsburgh, Salt Lake City, San Francisco, Seattle, Toronto, Vancouver.

276-A

Digitized by Google

Most Power per Fuel Dollar

And Savings In All Other Items Of Power Plant Expense

You don't need to be an engineer to understand the advantages of the Fulton-Diesel in securing power economies. It is a perfected stationary engine for industrial purposes. Using cheap and abundant low-grade fuel oil in internal combustion, emergency expenses and all hazards of delivery connected with coal are avoided. And the Fulton-Diesel uses but one-third of the fuel consumed in producing equal power with boilers.

Quick starting and stopping do away with standby losses inseparable from coal-made steam power. Fuel is fed automatically, consumed only when needed and in proportion to the load. Ash removal expenses are eliminated and all labor is performed by one attendant.

Being a complete power plant in itself, the Fulton-Diesel performs every function in the cycle of power generation. One compact unit, it requires comparatively little room and does away with boilers, stacks, condensers and other steam plant auxiliaries.

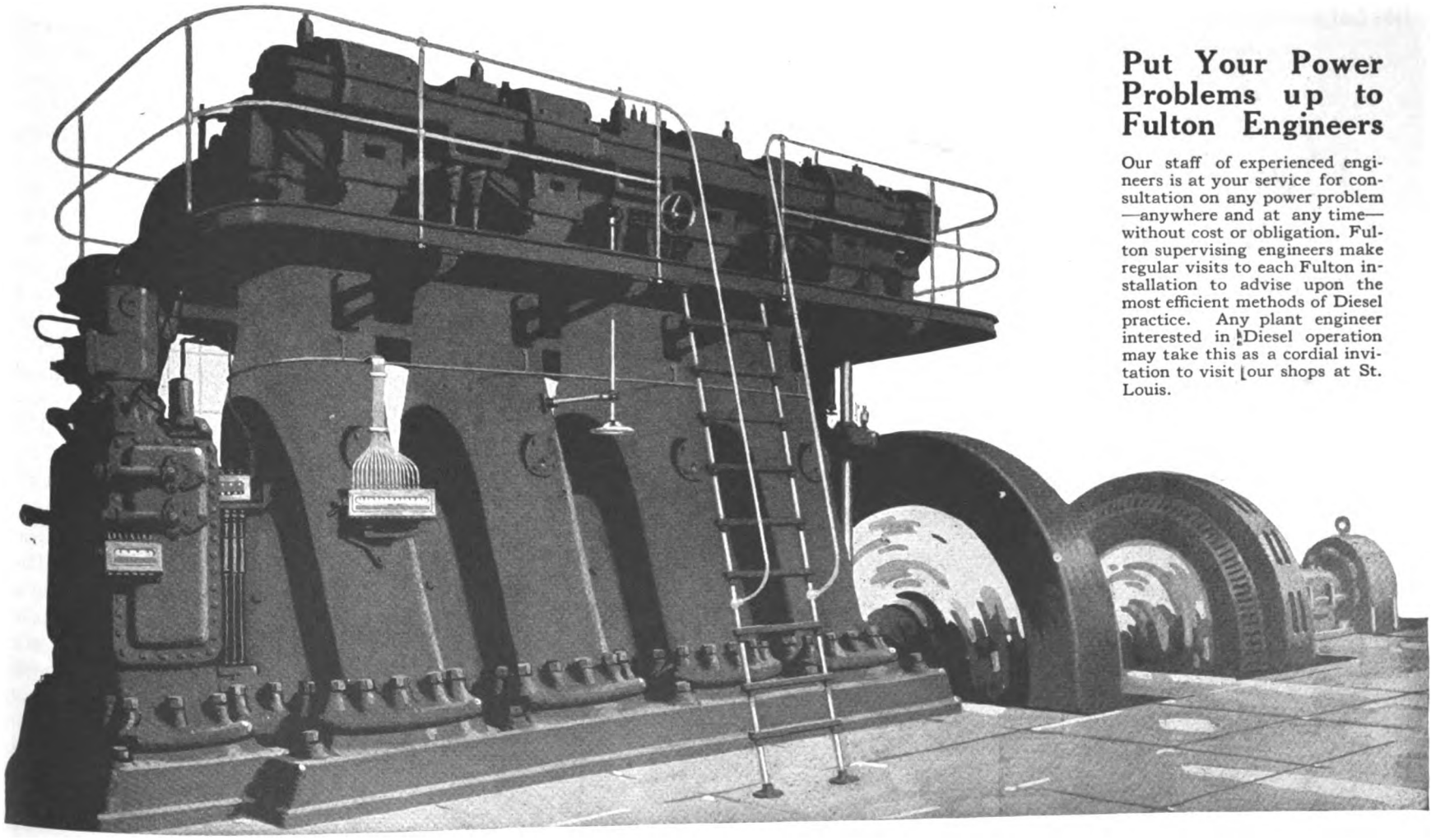
The Fulton-Diesel is an American-built engine, embodying 70 years' successful experience in engine building. Tested over many years of service under varied conditions, the satisfactory performance of one has repeatedly led to the purchase of another.

Fulton Iron Works Company, St. Louis, U. S. A.

Successful Engine Builders for 70 years

BRANCH OFFICES:

New York—82 Wall St. Dallas, Texas—Praetorian Bldg. New Orleans, La.—Hibernia Bank Bldg. Havana, Cuba—401, 402, 403 Banco Nacional.



Put Your Power Problems up to Fulton Engineers

Our staff of experienced engineers is at your service for consultation on any power problem—anywhere and at any time—without cost or obligation. Fulton supervising engineers make regular visits to each Fulton installation to advise upon the most efficient methods of Diesel practice. Any plant engineer interested in Diesel operation may take this as a cordial invitation to visit our shops at St. Louis.

FULTON DIESEL

Digitized by Google

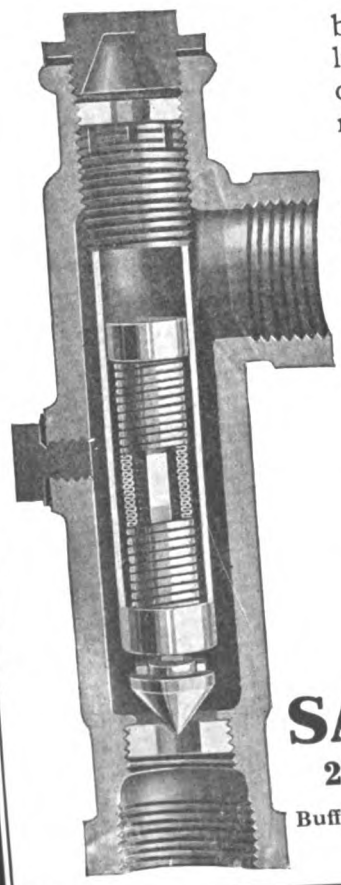


Why Pay $45 For $6 Worth of Iron?

Why pay $1.50, instead of 2¼c a pound for about 286 pounds of superfluous iron in a steam trap? That is literally what you do when you purchase a cumbersome steam trap of the bucket or float type, with its array of troublesome floats, levers, valves, water gauges, bowls, and other **unnecessary** parts.

The Steam Trap Sarco does everything that the larger, heavier and more complicated traps do. Yet it has but one moving part and weighs about 6% as much.

STEAM TRAP SARCO



because of its simplicity and light weight, sells for about one-third the price of other makes.

A Sarco saves money in the purchase price as well as in installation cost, for it requires no platform building, no supports, no pit digging. Can be easily and quickly installed at any point on the line.

Let us send you a Sarco on 30 days' trial. If you are willing to part with it at the end of that time, send it back and the trial will cost you nothing.

Write for Booklet R-9 and full information.

SARCO CO., Inc.

236 Broadway, New York

Buffalo Cleveland Philadelphia
Chicago Detroit

New Canadian Power Development at Niagara

(*Continued from page 26*)

the Niagara River and conduct it to a point on the Canadian side where it will plunge downward through penstocks and turbines and thence back to the Niagara River. It will avoid the Falls. The plunge downward just mentioned accomplishes substantially the same thing—namely, the drop from the Lake Erie level to the Lake Ontario level. The two drops, are not precisely the same, as at the Falls proper the drop is only part of the total between the two levels. Roughly, however, it is quite true that the diverted water has its Niagara Falls just back of the town of Queenston where the penstocks descend from the upper level.

This diverted water leaves the Niagara River at Chippewa, a Canadian town located near the natural mouth of the Welland River. It passes first of all through the bed of this river for a distance of about 4½ miles. It then enters the long power canal which conducts it to the head of the penstocks near Queenston. The Welland River is, in fact, diverted into this power canal. That is, that portion of the river not included in the final 4½ miles is diverted into the power canal, and Niagara River water comes from the opposite direction *via* the old channel of the 4½ mile section. So then, waters from the shortened Welland River and from the Niagara River unite and flow through the power canal. This is the plan that is being put through. What was the natural channel of the Welland River has water in it, some of which flows west to east, and some of which flows east to west.

The difference in level between the two lakes is 330 feet. It is expected to utilize 305 feet of this by a single drop near Queenston. Niagara Falls proper only drops about 162 feet—not much more than one-half of what is to be developed. The Canadians are taking advantage of the configuration of the country single plunge all that the Niagara River accomplishes in a which enables them to get in a long stretch.

The utilization of Niagara River water, whether on the Canadian or the American side, possesses a great advantage over the use of the water from many rivers that have had power development. There is generally a good deal of difficulty in maintaining an average flow. There will be an over-abundance at one time of the year and a great shortage at another season. In order to equalize matters, it is customary to construct one or more impounding lakes. In fact, the damming of upstream water may easily be one of the major items of cost in a power development. In some cases, no complete and constructed, whose duty it is satisfactory solution is possible at a reasonable outlay, and a duplicate generating station, operated by steam, is to make good any shortage of current from a small part to the whole of that required.

But hydro-electric plants along the Niagara River have back of them, as impounding reservoirs, all the Great Lakes excepting the smallest of the entire group. For this reason, the flow through the Niagara River is reasonably steady. The same may be said of the St. Lawrence River for the early part of its course.

When a power development is permitted to omit the control of the supply water, it is a great point in its favor. This the present development possesses.

Perhaps a slight qualification should be mentioned. The power canal which conducts the water from the point where Welland River and Niagara River water join to the head of the penstocks is widened in its later portion so as to provide a reservoir. The object is to secure uniformity of supply for the power-house. The size of this control-pool is very moderate, as it receives water with fair regularity.

It may be of interest to direct attention at this point to a financial matter. The first cost of a power development remains continually with the

Digitized by Google



"IT'S YOUR ORDER, Because Your Company Has a PHOTOSTAT."

"This is a job where delivery is paramount. And, in every case, I have made it a point to find out what kind of equipment the bidder had in order to make good his promise.

"Your Company has a piece of equipment on which I have learned to rely. I know what the PHOTOSTAT is and what it can do. I know you will not have to lose any time tracing. You can make PHOTOSTAT copies and get started on your shop work right away. In other words you'll be days ahead and I also know that there can't be any mistakes in PHOTOSTAT copies.

"Yes, sir, you tell your chief he can thank the PHOTOSTAT for this order. I know you'll make delivery with that machine to help you."

PHOTOSTAT prints cost cents. Compare this with what it costs for a draftsman to make a tracing, a stenographer to copy a page, or an artist to reproduce a layout.

The experiences of many users, written in letter form, are contained in our booklet, "A Good Word for the PHOTOSTAT." Write for your copy today.

PHOTOSTAT CORPORATION

295 STATE ST., ROCHESTER, N. Y.

84 Broad St., Boston	510 No. American Bldg., Philadelphia
123 W. Madison St., Chicago	317 Third Ave., Pittsburgh
209 Leader Bldg., Cleveland	429 Monadnock Bldg., San Francisco
7 Day St., New York City	601 McLachlen Bldg., Washington.

Executive Offices: Providence, R. I.

PHOTOSTAT

Trade Mark

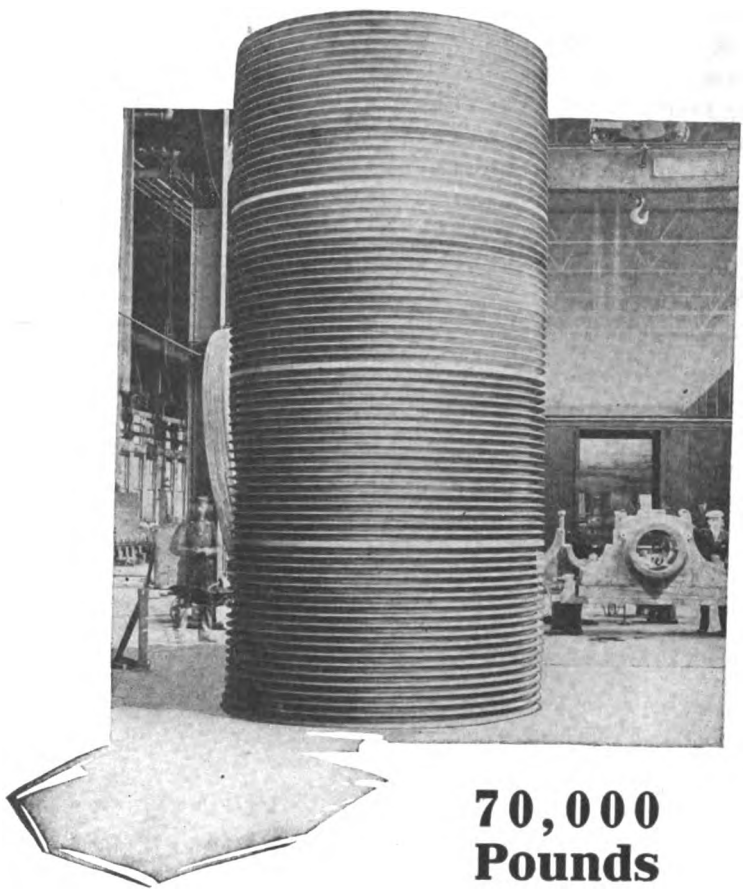
enterprise through its whole life—it does this in the form of interest on the initial investment. In fact, it may constitute a heavy drain on the revenues. When a big dam or a cluster of them may be omitted, the first cost is naturally reduced. This is by no means a negligible matter, as impounding dams may run into gigantic sums.

The decision between a hydro-electric plant and a steam-electric plant may become very close, chief items to be taken into account being the first cost of the engineering work in the one case and the cost of coal in the other.

The Niagara River is estimated as furnishing a total flow of 220,000 cubic feet per second. The international agreement provides for a withdrawal of 56,000 second-feet of the total for both countries. The Canadians get the larger share of this, 36,000 second-feet being their allotment. The new development, now occupying our attention, will be responsible for 10,000. The Canadians have, in other enterprises, absorbed about 18,000; so that 8,000 will be the amount available for future projects.

But, a unit flow of 1 cubic foot per second is not the same for all plants. This is to be accounted for by differences because of the topography and the like, and differences because of the design of the operating equipment. That is to say, the plants are not all on an equality with respect to natural and engineering advantages. With respect to the latter matter, the later plants have the possibility of utilizing advances in hydraulic engineering. The old power plants are understood to get from 12 to 15 horse-power out of a flow of 1 sec.-ft. The Ontario Power Company's development on the Canadian side is said to get 17 horse-power; and the Hydraulic Power Company's development on the United States side is rated at 20 horse-power. However, the Chippewa-Queenston development expects to realize 30 horse-power. This is a splendid result, and illustrates the differences that may result from a favorable combination of circumstances.

The margin between 305 and 330 feet is merely 25 feet. This



There is no power transmission problem too big for Dodge

THIS immense sheave built up in six sections with a face measurement of 107 inches and a total weight of 70,000 pounds is only a small part of the Dodge built equipment in one of the largest glass factories in this country.

Similar installations of gigantic power harness have been furnished by Dodge for practically every industry—rolling mills, paper mills, cement plants, coal and metal mines have relied on Dodge for power transmission equipment for over forty years.

The supplying of power transmitting equipment of unusual size and design is but a part of Dodge service to industry. The Dodge line includes everything for the mechanical distribution of power—carloads of stock pulleys, hangers, pillow blocks, etc., are available for shipment from our great central warehouses to our fourteen branches who in turn supply hundreds of local Dodge dealers.

Complete line shaft equipments assembled and tested before leaving our factory are designed and built under the supervision of engineers qualified by long experience in supplying the specific needs of the various industries served by Dodge.

You cannot afford to specify inferior transmission equipment—its efficiency has too great an influence on your profits. Make Dodge the standard in your plant—your judgment will be backed by the thousands of discriminating buyers in every industry who have profited by the continuous service, power savings and low upkeep characteristic of all Dodge installations.

Write for catalog—submit your problems for practical recommendations.

DODGE

Power Transmission Machinery

DODGE MANUFACTURING CORPORATION

General Offices: Mishawaka, Indiana. Works: Mishawaka, Indiana, and Oneida, N. Y.
Dodge Manufacturing Company of Canada, Ltd., Toronto and Montreal

New York	Pittsburgh	Minneapolis	Seattle	Chicago
Boston	Atlanta	Houston	St. Louis	San Francisco
Philadelphia	Cincinnati			

Digitized by Google

is the loss in head due to various causes. Twelve feet are accounted for in the 4½ miles between the Niagara River and the control works at the southern terminal of the power canal. Then the power canal itself accounts for 8 feet more. Two feet are to be allowed for the difference in level between the power house and Lake Ontario. Three feet of head remain. Of these, one-half foot is allotted to friction in the canal and 2½ to friction in the penstocks.

The rate of flow in the river bed is naturally much slower than in the power canal, largely because of the great difference in cross-section. An average velocity of 2 feet per second is estimated for the river section. This would mean a cross-section of 5000 square feet. The average in the power canal is put at about 6½ feet per second, which divided into 10,000 cubic feet per second gives 1538 square feet for the cross-section. The power canal runs, roughly, north over a route not much involved in changes of levels at the surface. It is consequently possible to construct a channel in which the cuts are not especially deep. Through a large portion of the total of 9 miles, the canal has its bed in the rock. However, at a point opposite the celebrated Whirlpool in the Niagara River below the Falls, the rock is too far down. The conjecture has been expressed that the sudden falling away of the rock level at this point is to be ascribed to the presence of a gorge formerly occupied by the Niagara River.

The outline of the cross-section of the canal excavation varies a good deal from place to place. In fact, there are no less than half a dozen representative sections. At the southern end occurs a section where the horizontal bottom of the canal is 70 feet wide. The banks have a moderate slope. The entire prism of the canal is at this point in the earth. To protect the banks, heavy rip-rap is employed as a facing.

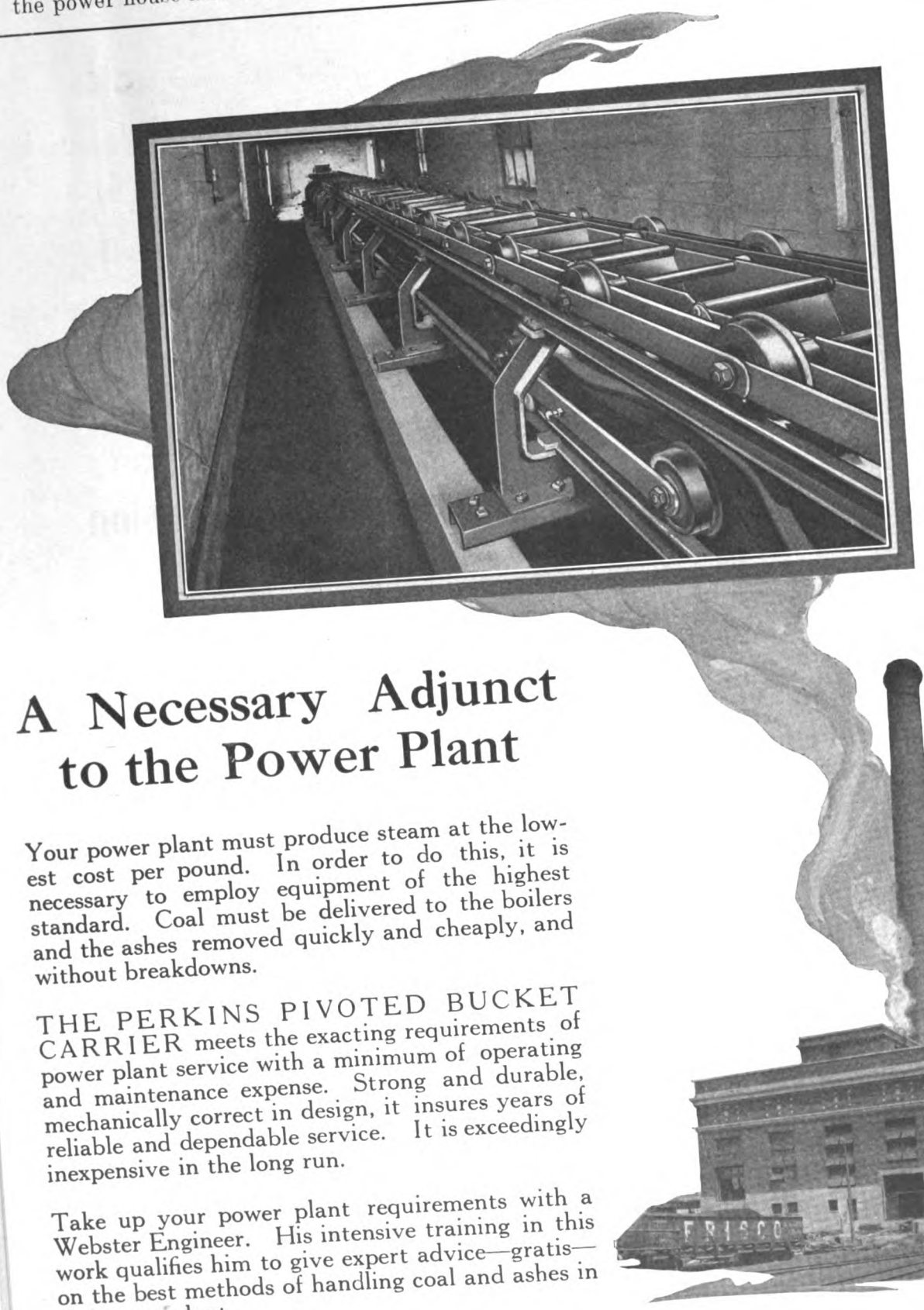
Further on northwards, the canal has a good part of its section in the rock. There is, however, a stratum of earth at the top. Here, the lower part of the canal has a rectangular rock section. The earthen banks of a moderate steepness begin to rise not at the edges of the rock excavation, but some distance back. There is thus a kind of a berm or ledge on each side.

Further north, the rock is covered by a thicker stratum of earth. The rock excavation is here narrowed. Still further north, we find both earth and underlying rock. But, artificial walls are here erected on the natural rock berms and thus carry the rock portion of the section to a higher level. These walls are filled in at the rear.

Going on further north, we find the canal section a very flat V; while near the power house where nearly the whole section is in rock, it is a simple rectangle.

It will be gathered from the foregoing that the form of the power canal is quite diversified in the course of its nine miles of length. That this diversification is due not to caprice and love of variety on the part of the engineers should be granted on general

(*Continued on page 42*)



A Necessary Adjunct to the Power Plant

Your power plant must produce steam at the lowest cost per pound. In order to do this, it is necessary to employ equipment of the highest standard. Coal must be delivered to the boilers and the ashes removed quickly and cheaply, and without breakdowns.

THE PERKINS PIVOTED BUCKET CARRIER meets the exacting requirements of power plant service with a minimum of operating and maintenance expense. Strong and durable, mechanically correct in design, it insures years of reliable and dependable service. It is exceedingly inexpensive in the long run.

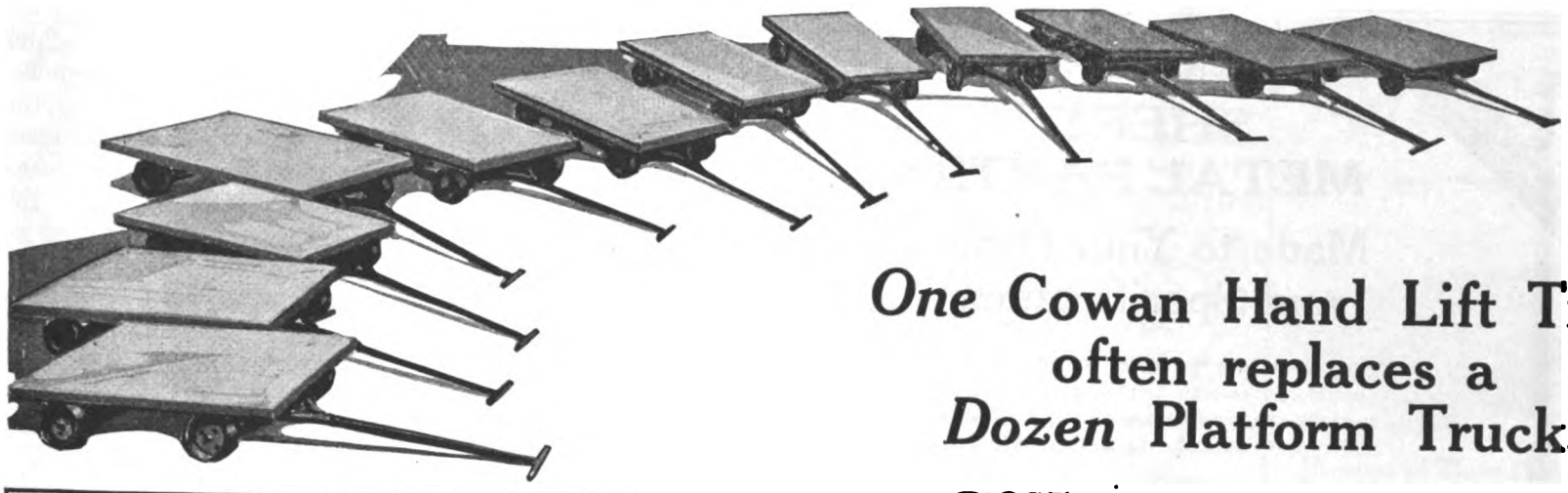
Take up your power plant requirements with a Webster Engineer. His intensive training in this work qualifies him to give expert advice—gratis—on the best methods of handling coal and ashes in the power plant.

THE WEBSTER MFG. COMPANY

4500-4560 CORTLAND ST., CHICAGO

Factories Tiffin, O. *and* Chicago-Sales Offices *in* Principal Cities

Digitized by Google



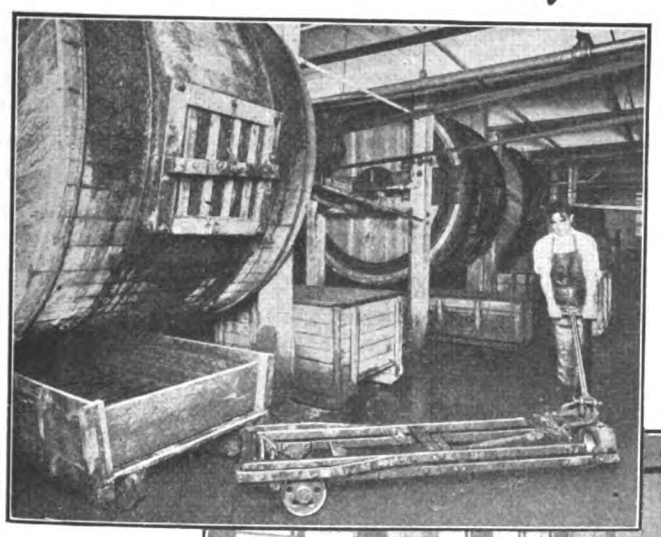
One Cowan Hand Lift Truck often replaces a *Dozen* Platform Trucks

COSTLY business—a separate truck for every load. Unnecessary, too.

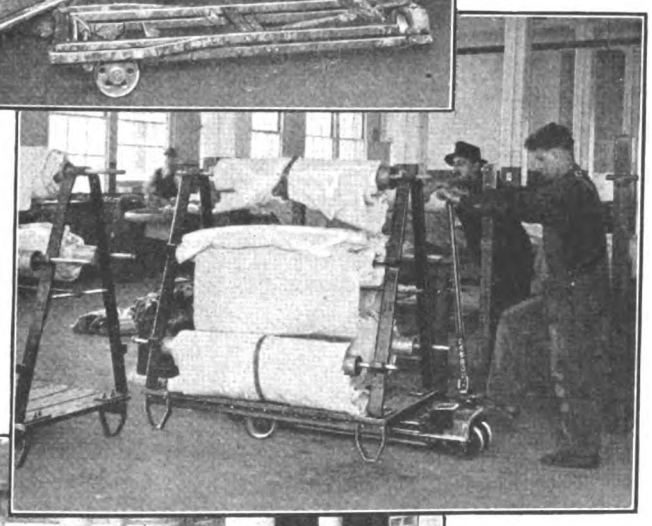
An inexpensive Cowan Skid takes the place of a costly platform truck. Simple construction—just a sturdy wooden platform, angle-iron frame, and non-wearing malleable iron legs.

One man and a *single* Cowan Hand Lift Truck can serve any number of loads mounted on skids. Skid and load automatically picked up by pressure on foot pedal and single downward movement of truck handle. Again pressing on foot pedal lowers skid and load to floor. No rehandling of load when moved from point to point.

Save on equipment, maintenance, time, and labor in your material handling. A Cowan catalog or a visit from a Cowan representative?



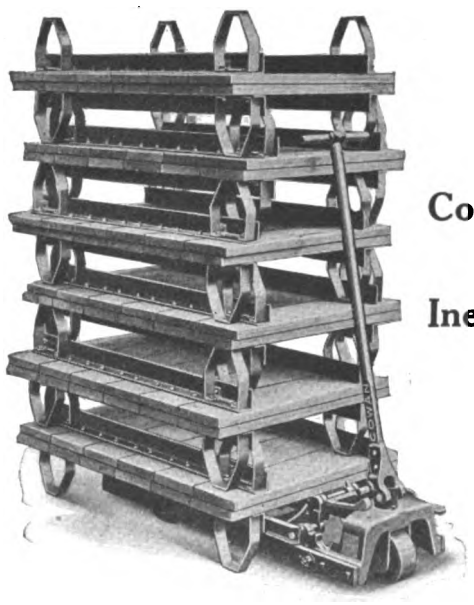
Handling skins in a tannery. Skid boxes and a Cowan Truck.



An ingenious Skid arrangement used in a New England tire plant.



Storage battery boxes handled on skids.



One
Cowan Truck and
Twelve
Inexpensive Skids

COWAN TRUCK COMPANY, 6 Water Street, Holyoke, Massachusetts

New York Office: Grand Central Palace—Offices in Principal Cities

Largest Manufacturers of Complete Hand and Electric Industrial Truck Systems

2037-N

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

Digitized by Google

G.P.&F. Service
Knowing How Since 81

STAMPINGS
SHEET
METAL PARTS
Made to Your Order
and Specifications





Send your blue prints or samples to headquarters. We can put whole batteries of specially equipped presses on your job, no matter how intricate the design may be.

Over 40 years experience in this work is a guarantee of speed and accuracy.

Many stampings or pressed metal parts that we now make were formerly castings, forgings or wooden parts. In most cases pressed metal stampings are not only cheaper but eliminate the expense of machining and fitting.

Let us show you what we can do for you in stampings, forming, drawing, punching, pressing and spinning in steel aluminum, copper, zinc, brass or tin.

GEUDER PAESCHKE & FREY CO.
1300-1800 CANAL ST., MILWAUKEE, WIS.
CHICAGO: 352-358 WEST OHIO STREET



EFFICIENT
VENTILATION

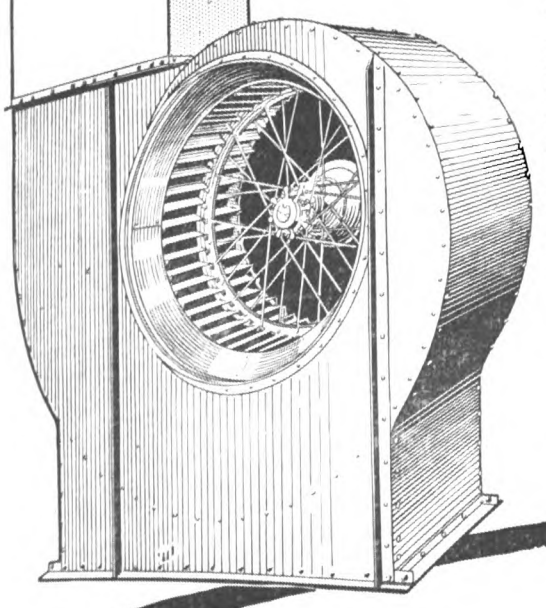
Can be obtained only through the use of equipment designed to meet the specific requirements for which it is intended.

Bayley PLEXIFORM FANS

are made in a variety of capacities from 300 to 300,000 cubic feet per minute. They are designed especially with a view of handling a maximum volume of air from a minimum of space and power requirement. Their efficiency as proved by installations in thousands of the largest industrial, public, school, theatre and office buildings, makes them prime favorites with architects, engineers and owners.

Write for Catalog

BAYLEY MFG. CO.
DEPT. (P)
MILWAUKEE, WIS.



(*Continued from page 40*)

principles. It can be accounted for by such homely considerations as the purpose to use a section involving the minimum of expense. This would vary with the location and character of the rock.

The character of the excavation required is also quite varied. This is due not merely to the changes in rock and overlying earth along the route of the power canal, but also to the fact that wet excavation has been in demand. This wet excavation is mostly in the old channel of the Welland River. This 4½-mile stretch must be made definitely to conform to the general requirements. Through this channel, for example, a definite flow of water must be withdrawn from the Niagara River and passed on to the power canal. There is a 12-foot drop in the 4½ miles. The problem that had to be solved was perhaps not especially difficult. It required a moderate modification of the river bed of such character that the necessary flow could be gotten with the gradients possible within the 12-foot limit for the 4½ miles.

The excavation necessary to bring the river bed to the engineers' lines has been going on by several methods. Thus, the cableway has been employed, together with the grab bucket. Then, dredges have been utilized in the work. And a certain amount of wet excavation has also been carried out at the southern terminus of the power canal. Here the first of the nine miles of canal lies above the rock. Back in the fall of 1920, it became desirable to get excavation going promptly in this region. The dredge competent to the work and otherwise available was in the control of the harbor authorities at Toronto on the northern side of Lake Ontario. The shifting of this great suction dredge to the scene of operations in the cold season was an interesting problem. It illustrates the unexpected requirements that construction people have to meet. The dredge had to be brought across the western end of Lake Ontario, through the Welland Canal and its many locks, along Lake Erie, along the Niagara River, through the portion of the Welland River which was to be reversed. Two tugs assisted in the transfer. Ice had at times to be cut away that was 4 to 6 inches thick, and the dredge itself deepened its own pathway for a portion of the shallow part of the channel and a separate dredge excavated a portion. All difficulties were overcome or set aside, and the dredge got duly to its station and has participated in the construction of the power canal as desired.

A great deal of concrete goes into the work. Naturally, the power house requires a large amount. But even aside from this use, concrete has been much employed on the work. Some of the slopes of the power canal have been protected with rip-rap. But rip-rap can not be used on very steep inclines. Concrete has been used on similar slopes, where it was more convenient or cheaper or where the slopes were rather steep. Concrete has also been used to provide a protective and smooth face for vertical walls.

A rather novel method of placing concrete was used on a section of the power canal near the Whirlpool of the Niagara River. The slopes are both high and steep. While concrete is perhaps the most useful of all construction material, its usefulness here was, for a time, somewhat at a discount, because of the cost in time and money involved in the form work. The vertical height to be covered was 54 feet. The slant was such, however, that the slab of concrete required measured 83 feet from base to top. One method employed proceeded by constructing concrete panels on the slopes that were narrow and parallel. These were 1 yard wide and the intervals between were 5 yards wide. The filling in of these was done with the aid of wooden forms. That is to say, a flat wooden form 16 feet long and three feet wide would be placed so as to bridge at the bottom the interval from one concrete panel to the next. Then the space back of the form would be filled with concrete. Later, the form would be shifted to a higher position, and 3 feet more of slant height filled in. In this way, the big panel 15 feet wide and 83 feet along the slant would be constructed.

Then a better way was de-

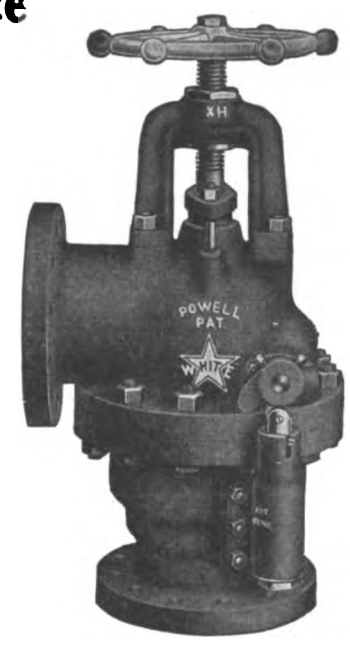
Digitized by Google

Powell Valves

Backed by 75 Years Experience

Powell Triple Acting Valves automatically close when a tube bursts —isolating the boiler.

Fig. 2228



POWELL WHITE STAR VALVES

are a combination of the most serviceable mechanical factors insuring to the user unfailing dependability.

Two reasons for their long life are their regrindable, renewable disc, both cast of Non-Corrosive Powellium Nickel.

Medium and extra heavy for steam working pressure up to 200 and 300 pounds.

SEND FOR DESCRIPTIVE CIRCULAR

The Wm. Powell Co.

2525 SPRING GROVE AVENUE CINCINNATI, OHIO

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½	inch	width	$10.68
9½	"	"	11.93
11½	"	"	14.00
12¼	"	"	15.45
13	"	"	16.00
14	"	"	17.59
15	"	"	18.84
18	"	"	22.00
18¼	"	"	22.90
24¼	"	"	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthochromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. *Our Customers will benefit.*

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company

(An Independent Corporation)

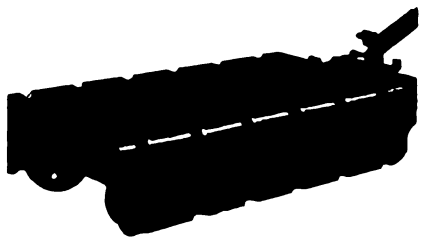
ROCHESTER, N. Y.

vised. As it represents an advance in the development of concrete practice, it is worth noting. The procedure was based on the use of a steel form of much larger size. It had one dimension of 16 feet as had the old wooden form, and this provided for bridging the inter-panel space having a width of 15 feet. But the other dimension of the steel form was made 17 feet. Naturally, a large flat form of this description had to be backed with suitable ribs. Two of these on the two sides were prolonged upwards and then brought together, the whole forming a draw-bar by means of which the form might be drawn up and let down. A winch was set up above and a suitable rigging arranged. In doing the concreting, the bottom would be done without this steel form and in the usual way. In this manner a bottom layer, measuring perhaps 20 feet up the incline, would be put in. Then the steel form would come into requisition. The winch would be started up, resulting in a very slow upward movement of the steel diaphragm. Concrete would be poured in at the top and the vacant space kept more or less filled. The new concrete would show below the base of the moving form before it had gotten very hard. There was advantage in this, as it gave the workmen whose duty it was to finish the surface of the concrete slab, opportunity to do their work while the concrete was still in the green state. It is understood that by this method a more uniform surface and a better finish were obtained. Some speed was attained by the new procedure. Thus, a slab measuring 55 feet up the slope was poured in the space of 10 hours. If this represents the actual time of concreting, without allowance for a meal, then the average speed of movement up the slope was 1.1 inches per minute. It will be readily seen that such a slow movement would not interfere with the pouring in any real way.

It has been found possible in carrying out the excavation for the power canal to use the channeling machine. This is a device in considerable employment in certain quarries where it is important not to waste the rock by more blasting than is

TRUSCON ALLOY ◆ PLATFORMS STEEL

Used in connection with lift Trucks



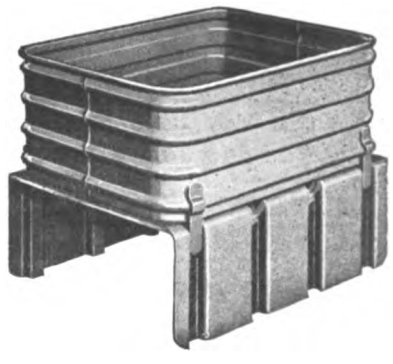
Because of Their Convenience

Every time materials are placed on the floor, money is wasted. To lift and place them costs money, and to set them down costs money. More than half of this constant expense is avoided by using the Truscon Alloy Steel Platform. To place the materials on a platform is even easier than to put them on the floor. Moreover, the hand operations of lifting the materials from the floor and piling them on the truck are altogether eliminated. The platform when loaded is quickly moved along by means of a lift truck.

Because of Their Durability

Any platform will save money in the ways described, but the maximum economy is secured thru the use of the Truscon Alloy Steel Platform. Formed of one piece of heavy gauge pressed steel stiffened by deep ribs, the Truscon Alloy Steel Platform stands up under hard use and saves repair expense. It does not get out of order nor wear down like wood; its clearence height remains uniform and the full width is available for inserting lift truck. Furnished in numerous sizes to meet varied conditions.

Truscon Boxes for Steel Platform



Skeleton boxes fitting any size platforms are furnished in various depths. They are either welded securely to the platform or equipped with steel stakes which slide into the ribs of the platform. Made of heavy gauge steel, reinforced with deep stiffening ribs and flanged edges. We make boxes to meet every requirement.

Tell Us Your Requirements for Anything in Pressed Steel Parts

Truscon Steel Company

YOUNGSTOWN, OHIO

Sales Offices in Principal Cities

Digitized by Google

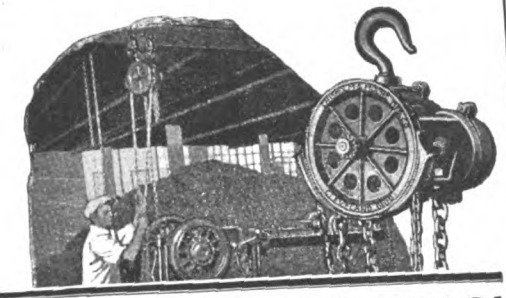
DIAGRAPH
YOUR SHIPMENTS

The Diagraph cuts legible address stencils for marking all packages, boxes, bags, cans, crates, castings and similar material. Addresses do not blur, wash or rub off. Safer than tags. A practical insurance against lost and delayed shipments.

Try one free in your own shipping room—price complete with all supplies, only $110.00 delivered, in either housed or open models. Order one on trial—no obligation to buy—we pay all charges.

DIAGRAPH STENCIL MACHINE CORPORATION
1625 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities. See phone books.





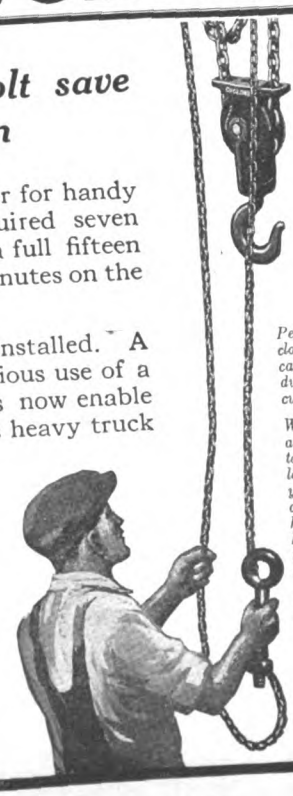
CYCLONE HOISTS
HIGH SPEED

—plus one man and an eyebolt save 102 minutes in one operation

TO invert this 3200-lb. industrial tractor for handy assembling operations formerly required seven husky men,—and the job consumed a full fifteen minutes. 7 men, 15 minutes,—that's 105 minutes on the time keeper's record.

Two Cyclones on overhead trolley were installed. A few whirls of the hand chain, and the ingenious use of a removable eyebolt to get the proper grips now enable one man to deftly pick up and invert this heavy truck in 3 minutes by the watch—a clean saving of 102 minutes on just one operation.

Don't think this saving an unusual one. Cyclones show surprising savings wherever they replace strong-arm methods!



Perhaps Cyclone Hoists can find production short cuts for you!

We have capable distributors in all localities to aid you in laying out material-handling and hoisting systems and submit estimates.

Catalog on request.

The Chisholm-Moore Mfg. Co.
Cleveland, O.

HOISTS CRANES TROLLEYS
Branches: New York Chicago Pittsburgh

necessary and to get the blocks in rectangular forms. It cuts a narrow and deep slot in a vertical plane. In ordinary engineering work, there has apparently not been found much service for this type of machine. The reason doubtless turns on the infrequency with which rather perfect vertical walls must be had in rock excavation work, and upon the natural instability of a good deal of the rock whose excavation is wanted. However, upon this Canadian enterprise, there is a good deal of fairly stable rock at points where vertical walls were wanted or were permissible. The method is slow and precise.

For general excavation in the dry, the steam shovel has been largely relied upon. It has been said in effect that the chief steam shovel in use on the enterprise was the largest in the world. This American-built machine is of such great size that an ordinary shovel is at times sent ahead as a pilot. The advance shovel digs out a small cut and the giant to the rear opens it out and does quantity work.

The initial equipment at the power house consists of two big 55,000 horse power turbines with generators to match. The penstocks which conduct the water from the forebay on the Lake Erie ledge down to the turbines are immense steel pipes 14 feet in diameter and about 450 feet in length. It should be understood by the reader that it is quite the custom to install less than the whole of an ultimate power equipment in order to keep the investment as low as possible. When the business develops and more current is in demand, other power equipment may be installed.

A Novel Solution of the Dust Explosion Hazard

(*Continued from page 15*)

and the tremendous loss of grain, has never been accurately determined but has been estimated at approximately, $3,750,000.00. It is certain that many millions have been spent in the rebuilding of this elevator.

In connection with this reconstruction work it is of extreme interest to note what steps were taken by the engineers in charge to prevent a recurrence of this disaster. The chief precautionary measure was the installation of a mammoth pneumatic sweeping system by means of which the heavy precipitation of dust on the walls, floors and other interior surfaces may be collected and whisked away by means of powerful air currents (or artificial winds) through a system of piping and thence to huge separators which separate and confine the dust until it is safely removed.

On first thought it would seem that the sweeping of floors by the suction process would be in the nature of a secondary measure and that the dust should be collected at its source, or confined and not permitted to escape. This is entirely correct from the theoretical standpoint, but in the handling of grain a large volume of dust is given off each time it is moved so that in spite of the most modern dust exhausting systems, a large percentage of the dust escapes into the air, whence it settles on the floors, walls, etc.

A striking feature of dust explosions is that there are always two explosions, viz., the primary and secondary. The primary explosion is that of the dust which is suspended in the atmosphere and is seldom destructive in its effects but if the building is heavily charged with accumulations of "static" or settled dust, this concussion of the primary explosion serves to agitate and stir up the accumulated static dust, which then explodes, making the destructive secondary explosion.

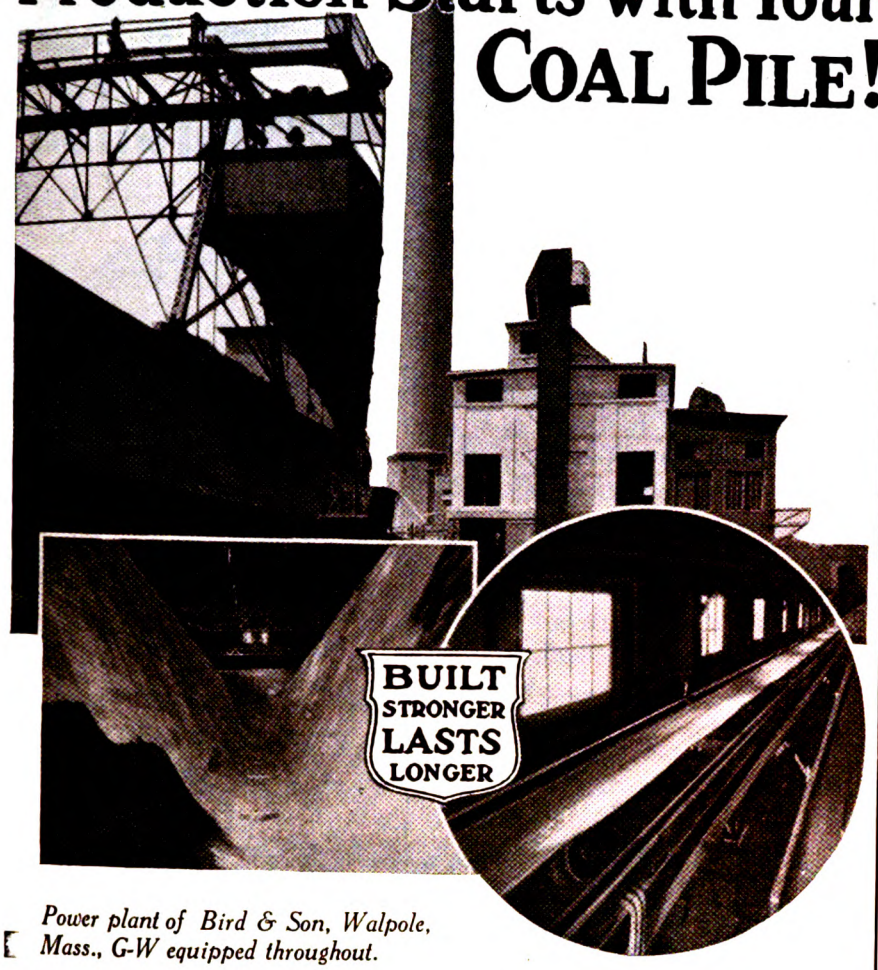
Obviously, if the building is kept clean and free from accumulations of static dust, this danger of the secondary explosion will have been eliminated.

This briefly explains why it was considered so important

(*Continued on page 46*)

Digitized by Google

Production Starts with Your Coal Pile!



Power plant of Bird & Son, Walpole, Mass., G-W equipped throughout.

Efficient Production Requires Efficient Fuel Handling

Constant, effective, low-cost power is an important factor in economical production. And it is often a considerable factor in establishing sales price schedules that get the business.

Gifford-Wood equipment ensures permanently economical handling of coal and ashes. You can bank on it year after year to handle fuel quickly, at low operating cost, and with almost negligible maintenance and depreciation. Is your power plant fuel and ash handling a source of profit—or just an item of expense? G-W Engineers are "profit building" engineers. Can they be of service to you?

G-W PRODUCTS

The Gifford-Wood Company specializes in elevating and conveying machinery for all lines of industry. These products include coal pockets, screens, hoppers, locomotive coaling stations, elevating and conveying equipment for ashes, stone, sand, gravel; wagon loaders, portable belt conveyors, pivoted bucket carriers, warehouse conveyors, car unloaders friction clutches, hoists.

MAIN OFFICE AND WORKS: HUDSON, N. Y.

New York: 50 Church St. Boston: 24 Milk St.
Chicago: 565 W. Washington St. Buffalo: Electric Bldg.

Gifford-Wood Co.

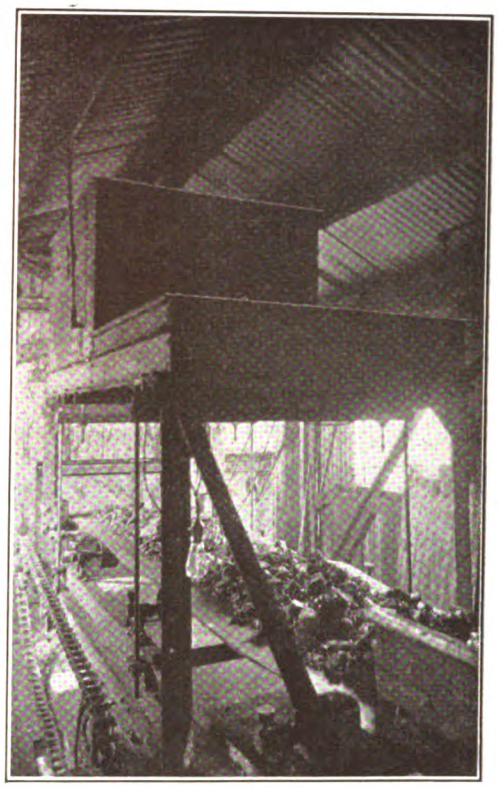
MATERIAL HANDLING EQUIPMENT

SAVE TIME AND LABOR

Use The

MERRICK CONVEYOR WEIGHTOMETER

Any material which is conveyor handled can be weighed without additional handling or loss of time by the Merrick Weightometer.

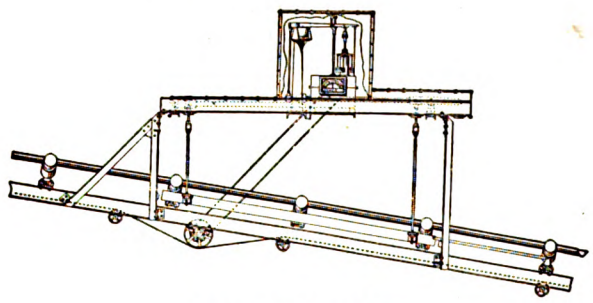


TYPICAL INSTALLATION MERRICK WEIGHTOMETER

Hundreds in use weighing all classes of materials such as

coal, run o'mine and crushed.
Coke
Stone, coarse and fine.
Gravel.
Sand.
Cement Rock.
Cement Clinker.
Metallic Ore.
Phosphate Rock.
Phosphate Pebbles.
Wood Chips.
Sulphite Pulp slabs.
Fish and Fish Products
Finished Cement
Zinc Ore,
Iron Ore.
Copper Ore.
Lead Ore.
Gold Ore.
Silver Ore.

NO WEIGHMAN OR ATTENDANT REQUIRED
GUARANTEED AND PROVEN
99% ACCURATE



Method of Installation

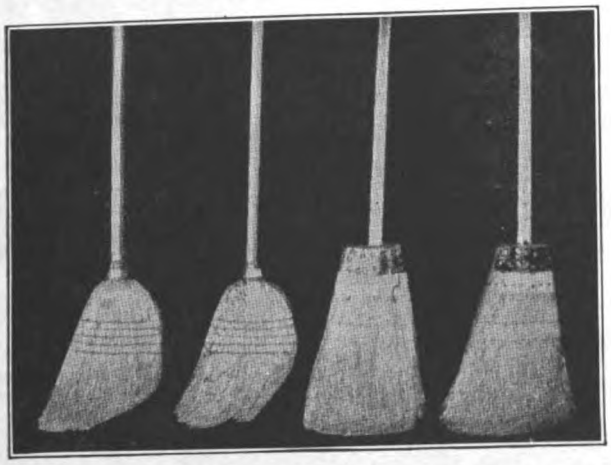
Why rely on Bill of Lading Weights?
Why not be able to tell exactly how much material you receive?
Hundreds of concerns buy and sell their products using Merrick Weightometer weights.

For Information Write

MERRICK SCALE MFG. CO.,

180 Autumn Street **PASSAIC, N. J.**

Digitized by Google



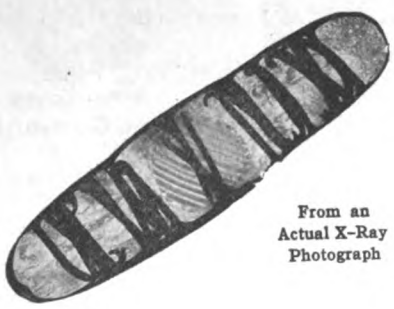
(Reproduced from an Actual Flashlight Photograph)

CAPITAL

Industrial Brooms and Brushes

Prove Superiority in Service

The photograph reproduced above shows the result of a severe competitive test conducted by a large railroad. The two CAPITAL "Red Cap" Metal-cased Brooms (at the right) were used with two ordinary "wire wound" brooms of similar weight under identical conditions. At the end of the test the "Red Cap" Brooms were still practically as good as new, while the wire-wound brooms were totally unfit for further service.



From an Actual X-Ray Photograph

This X-Ray photograph explains why "Red Cap" Brooms retain their material until completely worn out. Forty-two wrought-iron nails, clinched under 10,000 pounds pressure, criss-cross through the broom head. Nailing is the best construction to insure a solid, long-wearing factory broom. Always specify "Red Cap" Brooms on the purchase order to your jobber.

"Red Cap" Brooms Cut Sweeping Costs

Capital "Red Cap" Metal-cased Brooms not only sweep easier and cleaner, but experience proves that ONE "RED CAP" ACTUALLY OUTWEARS TWO OR THREE ORDINARY BROOMS. *Figure that saving in your own sweeping costs!* "Red Cap" Brooms are better made to meet the extraordinary demand of industrial use. They are built in a wide metal case, nailed from each side with wrought iron nails, with an extra metal reinforcing band and two rows of heavy waxed twine. The materials are carefully selected corn and split bamboo, all-corn, or corn and soft, round rattan. THEY ARE GUARANTEED, SUBJECT TO RETURN FOR FULL CREDIT WITHIN 30 DAYS, CARRYING CHARGES BOTH WAYS PAID BY US.

Every Industry Can Use CAPITAL Brooms and Brushes

The CAPITAL Line meets practically every industrial requirement in mill and factory brooms, push brooms, floor brushes, bench and counter dusters, etc. Our Catalog No. 17 illustrates and describes the entire line and from it you can select the brooms or brushes that meet your particular need. Our jobber near you (who probably is your own hardware or mill supply jobber) will then fill your order promptly and completely, under the terms of our money-back guarantee. SEND FOR CATALOG 17. Start Now to cut sweeping costs.

Indianapolis Brush & Broom Mfg. Co.,
I. W. LEMAUX, *President*
34 Brush St., Indianapolis, Ind.

→ MAIL THIS COUPON ←

Indianapolis Brush & Broom Mfg. Co.,
130 Brush Street, Indianapolis, Ind.

Send us Catalog 17, and the name of your nearest jobber.

Name.....

Address.....

(*Continued from page 44*)

to install this pneumatic sweeping system in the rebuilding of the Chicago & Northwestern Grain Elevator in order that at all times the building may be kept free from accumulations of dust and in order that the sweeping process itself may not constitute an additional hazard. In other words, the ordinary process of sweeping by means of brushes and brooms always raises a considerable cloud of dust in the air, thus constituting a very undesirable hazard, whereas with the pneumatic sweeping system the dust is all sucked into the nozzle and the sweeping process can not possibly raise or scatter any dust whatever.

This pneumatic sweeping system in Chicago & Northwestern Grain Elevator is designed on the order of the ordinary stationary vacuum cleaner but is of such tremendously greater size and capacity that it is referred to as a pneumatic sweeping system rather than a vacuum cleaning system. In this connection it is interesting to note that this is the largest pneumatic sweeping system ever installed in any building, there being something over two miles of piping and more than six hundred hose connection inlet valves distributed throughout the building so that a length of hose can be attached and the dust collecting work carried on in any part of the edifice.

The accompanying photographs clearly show the damage done to the elevator when the explosion occurred, other photographs showing the pneumatic sweeping system in operation, the advantages being not only the safe and dustless removal of dust, but also constituting a more efficient and economical means of cleaning the building.

As the system collects from two to three carloads of dust per day, the dust separators were necessarily of a special design with a continuously operating discharge valve, by means of which the dust is discharged from the vacuum tank to the atmosphere without destroying the vacuum in the tank. When discharged from the separator the dust is dropped into a low pressure exhaust system which conveys it through a sheet metal duct

(*Continued on page 48*)

COAL Preparation



"Pennsylvania" Bradford Breaker

WHAT DOES TRAMP IRON DO TO YOUR COAL HANDLING MACHINERY?

"Pennsylvania" Bradford Breakers and Hammer Crushers automatically and accurately pick out the tramp iron during the crushing operation, preventing damage to crushers, and stokers, without extra power or upkeep.

In addition, "Pennsylvania" Bradford Breakers automatically remove the harder impurities including slate, bone, rock sulphur balls and mine props, together with the tramp iron, while preparing Bituminous coal for Stokers, By-Product Coking, Gas Making and preliminary to pulverization for Powdered Fuel Plants.

We have brought the right solution to many coal preparation problems, and are ready to cooperate, on receipt of your suggestion.

Send for Bulletin 6001.

PENNSYLVANIA CRUSHER COMPANY

1320-1325 Stephen Girard Bldg.,
PHILADELPHIA, PA.

Digitized by Google

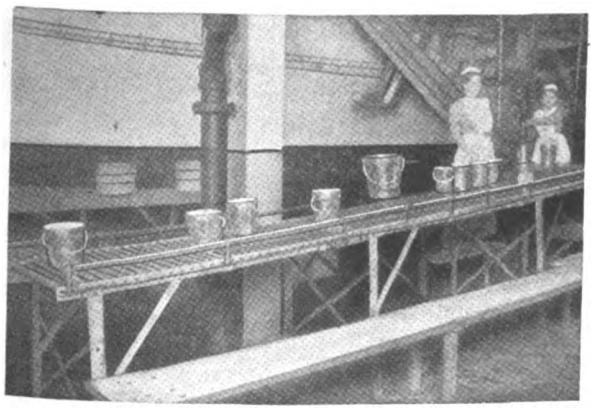
Safeguard Against Labor Shortage

THE labor situation makes it imperative to take steps immediately to prevent a serious curtailment of your output. Whether or not your business is listed as essential makes little difference. The present shortage can only grow more acute and make itself felt in every line of manufacture.

The first and most practical economy should be to eliminate hand conveying. This has become a form of labor wastage, for in the majority of cases, man power can be supplanted by the Mathews Gravity Roller Conveyer. Gravity conveying not only cuts down your payroll but it cuts out unnecessary delays, breakage costs and the unreliability of unskilled labor.



Bringing in the fresh fruit from the car or wagon



Gravity carries pails or boxes of cans equally well



Switches bring different products to a shipping point

Many of America's largest and most far-sighted manufacturers foresaw present conditions and realized the value of the Mathews Gravity Roller Conveyer in such an emergency. Their experiences have proved conclusively that it pays for itself many times over in labor saved. You too can raise the efficiency of your plant with the

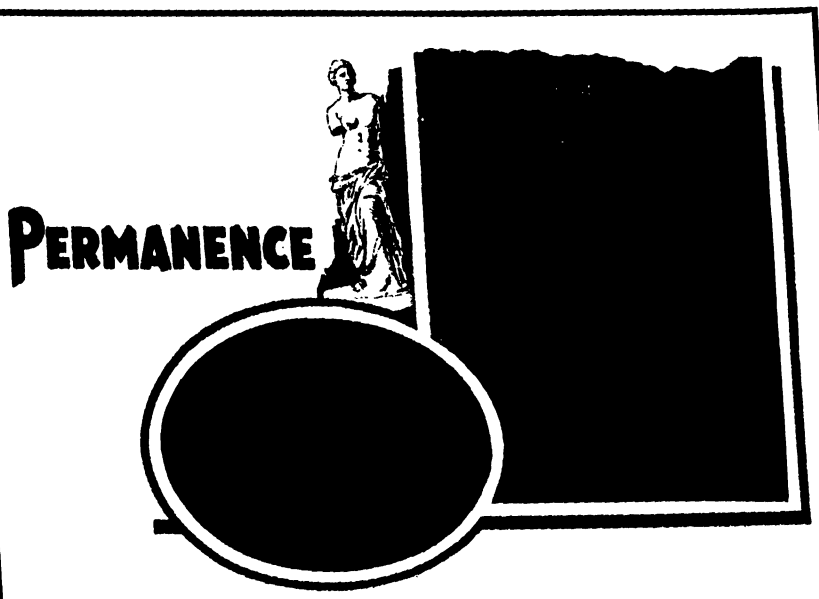
MATHEWS
SPEED ECONOMY
GRAVITY ROLLER CONVEYER

Gravity eliminates heavy conveying from the packing room and other departments. This condition enables you to replace men with women and makes you further independent of labor conditions.

The Mathews Gravity Carrier Company manufacture the most highly perfected gravity conveying system now on the market. The system is so complete in fact, that it can be adapted to the needs of practically any plant. We maintain a staff of engineers to solve conveying problems of unusual difficulty. Let us help you cut the cost of production and speed up work. Drop us a line.

MATHEWS GRAVITY CARRIER CO.
122 Tenth Street, Ellwood City, Pa.
Branch Factories: Toronto, Canada—London, England

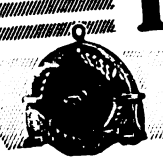
Digitized by Google



HERE is a Terry performing under difficulties. Installed in a marble quarry, exposed to the elements, clamped to irregular rocky surface without grouting, strained by unsupported pipes—but still it functions and drains the water from the quarry so that beautiful building material can be removed. It may be a long way from the statue of Venus to a Terry turbine, but though it was once stormed by the elements and buried in volcanic dust, Venus has been restored to us and still functions as a work of art. We can only surmise what beauty this statue might now possess had it received the protection such creations should have. But we know what Terry turbines will do under the care and protection of the modern power plant, for ninety-six of the first hundred Terrys which were made some twenty years ago are still in operation. Inbuilt permanence is a Terry feature which you should consider.

T-799

THE TERRY TURBINE



Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co. Terry Sq. Hartford, Conn. U.S.A.

(Continued from page 46)

more than 1,000 feet away to the dust house which is located at some distance from the elevator proper.

The enormous air exhausting plant of the pneumatic sweeping system consists of four 25 horsepower units, connected in parallel. These units constantly maintain a high degree of vacuum throughout the entire piping system so that whenever an inlet valve is opened and a length of hose attached, there is a tremendous and powerful suction, so powerful indeed that the system is fully capable of removing iron nuts and washers although of course there is no occasion for it to remove anything but the dust which is being constantly precipitated in such tremendous quantities.

Converting the Airplane to Peace-Time Use

(Continued from page 16)

although it owes its greatest development to the needs of warfare, may be transferred directly to spheres of usefulness in the arts of peace.

When it is realized that the flying of heavier than air machines has been practiced successfully for less than twenty years (the first successful flight was made by Orville Wright, December 17, 1903) it is really little less than marvellous that in so short a time the science of aviation should have reached the stage of success that it has at present, particularly as it is really only within the last half-dozen years that it has advanced past the purely experimental stage. It is perhaps a sad commentary upon the state of our civilization that those engaged in working towards the perfection of the aeroplane should have received so little encouragement until the necessity arose for more efficacious machines for slaughtering men. On the other hand, as the incentive which the war gave to the development of aeronautics embodies one of the few instances where civilization has scored an advancement as a result of the war, it may be well perhaps to take the advantage offered without looking too closely into the sources from which it comes.

This is the course that is being followed by the Dominion of Canada. Before the war, aviation in Canada practically did not exist. It was a form of service, however, that attracted a great number of young Canadians to the British Imperial Air Services; and after the Armistice Canada found herself with a corps of trained airmen second to none in the world in point of experience and efficiency. These young men had been recruited from various walks of civil life and they could, of course, go back to their pre-war occupations, as many were quite glad to do. But there were others who, having once tasted the savor of flying through the air, were very reluctant to return to field, office or factory. So it was really not until after the war was over that the Canada Air Board came into existence. Its purpose was to utilize to as great a degree as possible the training and experience of this body of men for the uses of the future and to direct their activities as far as possible into the constructive purposes of peace.

The functions of the Canada Air Board are threefold:

1. Control of Civil Aviation. This has to do with the examination and licensing of pilots; registration and inspection of aircraft; the surveying and charting of aerial highways and air harbors; and the enforcement of regulations laid down by law from time to time for the guidance and control of aerial navigation.

2. Civil Government Flying. This branch of the service is for the purpose of lending assistance to other government departments, such as Forestry, Mines, Fisheries, Customs, Agriculture, etc., wherever aircraft may be used to expedite the work of that particular department, or to reduce costs of operation. Seven Civil Government Flying Stations have been established throughout the Dominion: at Vancouver, B. C.; High River, Alberta;

(Continued on page 51)

Digitized by Google



That man Jones in your factory is wasting your money

That man Jones, who operates one of the many machines in your factory, is keeping his own time on a slip of paper. In the same way all the Smiths and Browns and others in your factory are keeping their own time.

And every time that they set down the elapsed time on a job the odds are ten to one that their records are inaccurate. For Jones, and Smith, and Brown are human—just as liable to make an error as you are.

Why persist in letting your mechanics guess at the time each job takes? Why not install a machine that records the elapsed time by a simple pull on a lever?

The Calculagraph is a spring-driven machine free from the wiring troubles of electrical time recorders. It stamps the starting, stopping and ELAPSED TIME right on the job ticket.

It eliminates all errors on the part of the operator. He no longer guesses. The printed record is there as proof.

It saves the time of cost clerks. They no longer need to subtract starting from stopping time. The elapsed time can be read direct from the job ticket.

Any number of workmen can use one Calculagraph. A backward-forward movement of the right hand lever when the job starts, a pull on the left hand lever when the job is done, and the time record is complete.

Send for our booklet "Elapsed Time Records" today. It will interest you.

THE CALCULAGRAPH

THE ELAPSED TIME RECORDER

34 Church Street, New York City

Digitized by Google

More Valuable Than Gold

THE subject of our cover for this month is a photograph taken 7,500 feet below the surface of the ground. It shows copper ore being dumped into a skip for hoisting to the surface, in the Calumet-Hecla copper mine at Calumet, Michigan.

We are accustomed to thinking that gold is the most valuable metal in the world, with the exception of platinum. These two metals, it is true, possess one characteristic which sets them apart from the commoner metals—their immunity to corrosion. Nevertheless, while gold is an accepted standard of value, the metal itself has contributed almost nothing to man's advancement. From a standpoint of usefulness, gold is handicapped by excessive weight, softness, low tensile strength, high electrical resistance, low heat conductivity. Even if we were to discover unlimited, easily workable deposits of gold, the effect would only be to throw the world's financial machinery out of gear.

If, on the other hand, we were to discover unlimited and easily workable deposits of copper, there is hardly a field of human endeavor that would not benefit. The telephone, the telegraph, and their younger brother, radio, all depend upon copper. Without copper, there could be no brass or bronze. Lacking copper, there would be no such things as electric lights and electric motors; we could not proceed with electrification of railroads and development of water power.

If gold failed us, the world would have to readjust its financial system on a basis of silver or platinum, perhaps—but if copper should fail, civilization must halt its onward march until some as yet unknown substitute could be found.

Dramatize Your Facts and Figures!

Put them into Pictorial form. The Chart is the one Universal language, which every man understands. It is a great time saver. It enables you to get across what you want to say interestingly, quickly, accurately and persuasively.

Willard C. Brinton's

"Graphic Methods for Presenting Facts"

Shows you how to make, read and use charts better than any other book published.

GRAPHIC Charts show at a glance what it would take page after page of small type to explain. The use of Charts, therefore, is becoming more and more universal in modern business, as the best, quickest, most economical, and most easily understood way to present facts, visualize tendencies and show results.

But few of us, however, know how to make or use good charts. Hence the presentation of our facts is often confusing, misleading inaccurate, defeating the very purposes for which our reports have been drawn up.

Mr. Brinton's handbook is the most comprehensive and practically useful work on the subject of graphs ever written. Is not only shows how to make, use and read charts, maps, diagrams and plotted curves of every description, but also classifies all the serviceable methods of graphic presentation, pointing out the uses and defects of each.

Everywhere it is recognized as the standard. It is one book which should be at the elbow of every man who handles statistics of any sort, or who makes or receives reports—every man who wants to know accurately how things are going in his business—every man who wants others to know what he is doing or to see things in his way—the executive, the manager, the department head, the engineer, the statistician, the cost accountant, the sales manager, the public official, the lawyer.

To know how to insure your reports being read, your facts remembered, your figures understood, and your statements always accorded a hearty and interested welcome, let Brinton's handbook be your guide.

383 pages, 7x10, 256 illustrations; red cloth, $6, postpaid
It costs you nothing to examine the book at your leisure

FREE EXAMINATION

No money down. You keep the book only if you are convinced that it is worth the money.

To see for yourself just what the book will do for you, SEND NO MONEY NOW. Simply fill in the coupon below. If the book does not come up to your expectations, or if you think you can get along as well without it as with it, return it in ten days. If it pleases you, remit the price in 30 days.

MAIL THE COUPON TODAY

THE ENGINEERING MAGAZINE COMPANY
120 West 32nd Street, New York

Send me one copy of "Graphic Methods for Presenting Facts" on approval. I shall either return it in 10 days or remit the price in 30 days.

Name..... *Street*..... *City*.....

State..... *Business connection*.....

Digitized by Google

(*Continued from page 48*)

Victoria Beach, Manitoba; Sioux Lookout, Ontario; Ottawa, Ontario; Roberval, Quebec; and Dartmouth, N. S.

3. Canadian Air Force. This is the military branch with its central training camp at Camp Borden, Ontario.

This article will deal with the second of the above classifications.

Perhaps the greatest field for the employment of aircraft is in connection with Canada's great forest areas. First of all, and of most importance, is the detection and fighting of forest fires. If great fires could be prevented from levying their annual toll upon the Dominion's forest areas the lumberman would probably have some difficulty in keeping pace with the yearly growth; but as it is, fire constitutes the greatest menace to the continued existence of the forest. During comparatively recent years an efficient system of fire supervision has been instituted by the Dominion Forestry Department, but Canada is a large country, the timbered areas being naturally in a great many cases far from settled neighborhoods, and fire rangers, having immense districts to supervise, quite often find difficulty in reaching the scene of a fire before it has gained such a start as to be almost beyond control—or at any rate, before a greal deal of valuable timber is destroyed. Frequently the fire ranger, after discovering the fire and realizing he can do nothing unaided, has to travel long distances on foot, by canoe or on horseback before being able to reach the nearest telephone in order to summon assistance. With the aid of the aeroplane, or flying boat, however, it is possible to make regular patrols over the whole district at frequent intervals. When smoke is seen in any part of the area its origin can be investigated almost immediately. If the fire can be coped with by the fire-ranger with the assistance of the air pilot this is done; if it has gained too much headway, additional men can be rushed to the scene by aircraft.

The following excerpt from a report of the Dominion forestry supervisor for Manitoba after making an experimental flight of 1,000 miles by seaplane will give some idea of how aircraft appeals to a man whose previous efforts at fire detection and prevention have been conducted from a canoe. He says:

"From my observation I am thoroughly convinced that flying boats are very far ahead of our present method of patrols. We could always see from 30 to 50 miles on either side of the plane, and it would be no difficulty to locate smoke at this distance. When you compare this with a canoe traveling up a river with high banks, where it is impossible to see more than 100 yards in either direction, and where the patrol would be unable to notice smoke unless it were driven down over him, the advantage is entirely on the side of the plane. By reading the diaries of the fire rangers I find that in a great many instances, even though they see smoke, they spend days in locating the fire, and I am convinced that half of the fires which occur are never located or reported. On the other hand, the aeroplane is able to fly directly to the scene of the smoke, and land on a nearby lake. We have already proved this conclusively, as we have observed smoke, located the fire, taken men to the fire district and extinguished the fire in five cases east of Lake Winnipeg. * * * I am thoroughly convinced that patrol with canoes is obsolete, and also convinced that it will be possible to do the work more efficiently with aircraft and at considerably less cost than our present methods."

The wanton destruction of the forests of North America during the past century is a standing reproach. Governments and individuals alike are now coming to a realization of the fact that only by large-scale reforestation can the forest heritage of the past be transmitted to future generations. Reforestation, however, requires a knowledge of the forests, their area, the density and condition of the timber thereon, and many other particulars. It is estimated that such a survey of Canada's forests would take almost half a century by using the methods of the past. In the first place, in former days, it was necessary to reach the particular area to be surveyed. This was



"If you ever have a *real* business problem, send for him"

"YOU KNOW there are some problems which a man can't take to his partners or even his personal friends."

The speaker was an officer of a growing company in a middle western city. It was the lunch hour; he and a business associate were on their way to the Club.

"I had such a situation in my own experience a year ago," he continued. "I don't need to go into the details except to say that the decision would make a lot of difference not only to me, but in the whole policy of our concern.

"One afternoon in my office I was trying to think the thing thru. What I wanted was someone I knew well enough to trust, but who didn't know me *so* well that he would let personal considerations influence his judgment. I was just about stumped when my secretary brought in a card. I recognized the name of the local representative of the Alexander Hamilton Institute."

The speaker paused and pointed to a man across the street.

"There he is, going into that building," he said. "Seeing him reminded me of the story.

"Well, his call struck me as a sort of inspiration. I said to myself, 'Here's a chap who has probably talked over more different kinds of business problems than almost anyone else in town. He's trustworthy, he goes in and out of all sorts of offices and he knows how to respect a confidence.'

"To make a long story short I had him sit down and listen while I laid all the cards on the table. We were together for more than an hour, and he made the most direct and intelligent suggestions you can imagine. He had nothing to gain directly from this but he could not have been of any greater help if he had been doing it for a large fee. If you ever have a *real* business problem I'd advise you to send for him."

One of these representatives lives permanently in your locality. He is meeting ten men a day on an average, sixty men a week, three thousand in a year. They talk to him with surprising intimacy about their business problems and future, *not* because he is inherently wiser than they, but because the confidences of so many men have given him an unparallelled wealth of experience.

He may come to you some day with a card from one of your friends. The purpose of his call will be to explain the Institute's Modern Business Course and Service but you will find him ready and anxious to give you the best he has in the way of friendly co-operation and sincere advice. It is his business to put before you the facts regarding the Institute's method of providing sound business knowledge by means of its Course and Service. His personal success depends on his ability to help the men on whom he calls. Consequently, we should like to have you feel that his call is a service call in the fullest sense of the word. The Alexander Hamilton Institute was founded *for service* to business men.

You will be interested in learning how much its service includes as explained in the little book, "Forging Ahead in Business," published for distribution to men at the top, and men who are on their way. A copy of it will go forward to you with our compliments if you will fill in the coupon and return it to us.

Alexander Hamilton Institute
689 Astor Place, New York City

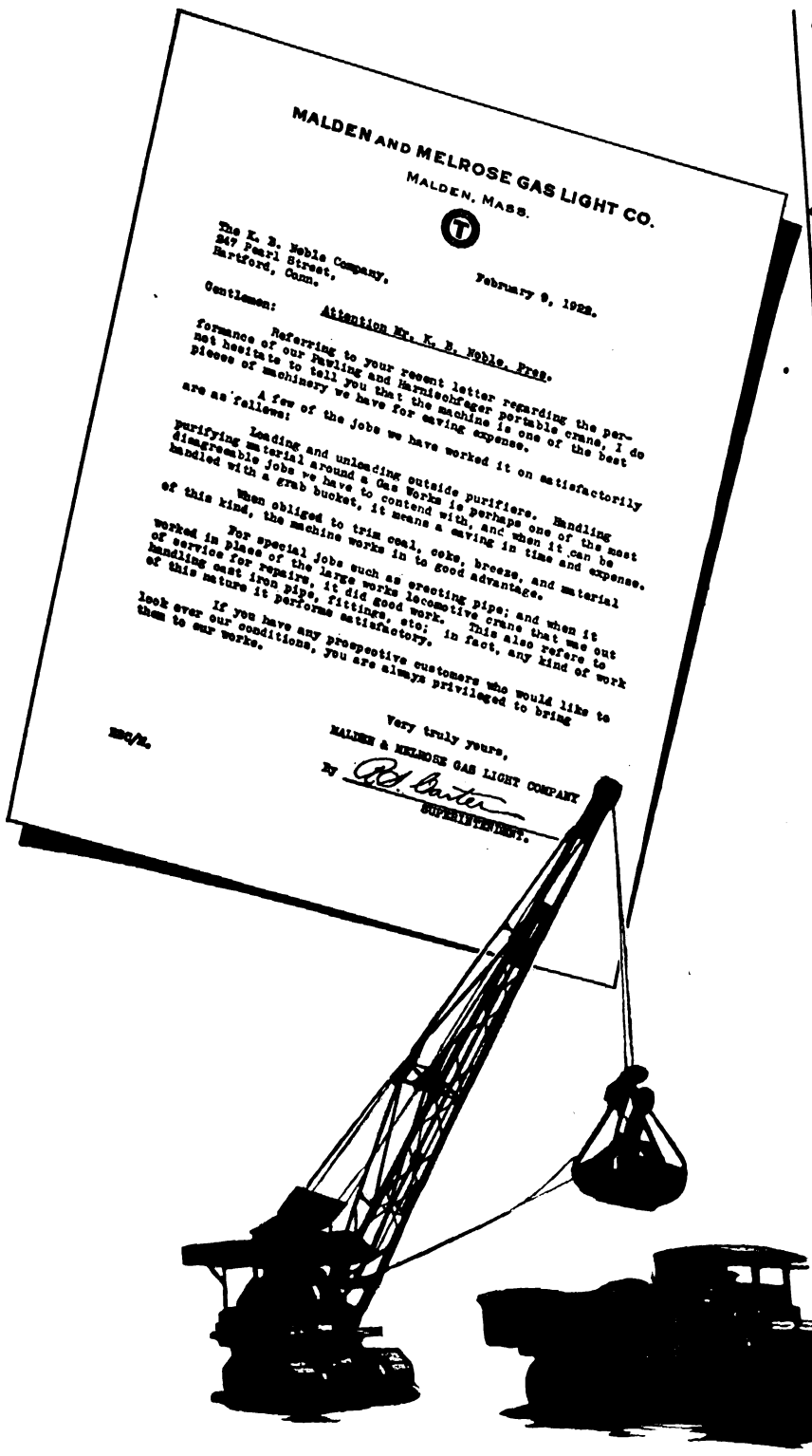
Send me "Forging Ahead in Business" which I may keep without obligation.

Name .....
Print here
Business Address .....
.....
Business Position .....

Canadian Address, C.P.R. Building, Toronto; Australian Address, 42 Hunter St., Sydney

Copyright, 1923, Alexander Hamilton Institute

Digitized by Google



P-H **CORDUROY CRANES**

"One of the Best Pieces of Machinery We Have—For Saving Expense"

The P & H Corduroy Crane in the industrial plant yard is not only more economical than common labor—but in addition frees the user from the troubles of getting such labor.

It is maneuvered about readily—requires no track—and has therefore a wider range of usefulness. For unloading cars its economy is particularly remarkable because it is smaller than a locomotive crane, costs less—but operates faster along any part or either side or end.

The same quality of design and construction as P & H Overhead Traveling Cranes and Hoists. Gasoline or electric motor-driven,—controlled entirely by *one* man.

Bulletin 40-X gives complete details.

PAWLING & HARNISCHFEGER CO.

Established in 1884

3850 National Ave., Milwaukee, Wis.

Offices and Agents in Principal Cities

done by means of canoes or packhorses, depending upon where the timber was situated. Then the tract must be thoroughly cruised on foot, a number of measured areas containing an average growth marked off, the number of trees counted in each, the diameters and heights measured or estimated and the whole recorded so that the total amount of timber upon that particular tract might be estimated as closely as possible.

By means of aircraft, however, the cruiser can travel as far in an hour as he previously did sometimes in a week. Once arrived at the particular tract it is possible to fly above the timber and make a thorough examination of it. Also, if necessary, a series of photographs may be taken and a mosaic made of the whole area. This can be supplemented by a number of "close-ups" taken from a distance of just a few hundred feet above the tree-tops showing every tree in detail. Armed with these, and the data secured during the flights, the aerial timber cruiser can complete his estimates in the comparative comfort of his office.

A further use has been found for aircraft in connection with the forest areas in assisting the work of studying and combating various forms of tree-destroying insects. Next to fire, perhaps the greatest enemies the forests have are insects. The Canadian government maintains an efficient staff of entomologists, but here again the vastness of the country's timberlands and the great distances to be traversed would require an enormous staff of men to make even an attempt to deal effectively with these pests; but with aircraft the story is different. The entomologist can examine the forests from above, locating the points where insects have been at work; these are marked upon the map and remedial efforts concentrated upon the places most needing them.

One would hardly imagine that the airplane could be of any use in fighting the nimble mosquito, yet the following extract from a report of a Dominion government entomologist in charge of mosquito investigations shows how it is done. He says:

"For years there have been demands for an investigation into the mosquito pest of the Fraser Valley, B. C. During bad seasons all outdoor activities have been seriously affected, lumber camps have been obliged to close down, small fruit picking has been hampered, and great material loss has been incurred through the drop in milk production in the dairy sections. Cases are even on record where cattle have actually succumbed through attacks of mosquitoes.

"In 1919 the entomological branch commenced an investigation embracing the 2,000 square miles of affected territory, and it was found that the nuisance had its origin in the low-lying areas adjacent to the Fraser River, and subject to flooding at times of high freshet. It was found that serious outbreaks never occurred at flood levels under 17 feet 6 inches, but where the flood level exceeded 18 feet 6 inches a serious scourge almost invariably resulted. For two years efforts were made by local surveys (by auto, on foot, and by boat) to locate and define the position and extent of the various breeding areas (which often ran to many thousand acres). It was found impossible to obtain sufficient data over such an extensive territory, and the value of aerial surveys in this connection presented itself. The results obtained during the present season [1921] have justified our expectations, and I am of the opinion that this is the most feasible method of covering such an extensive territory, where detailed maps are not available. * * *

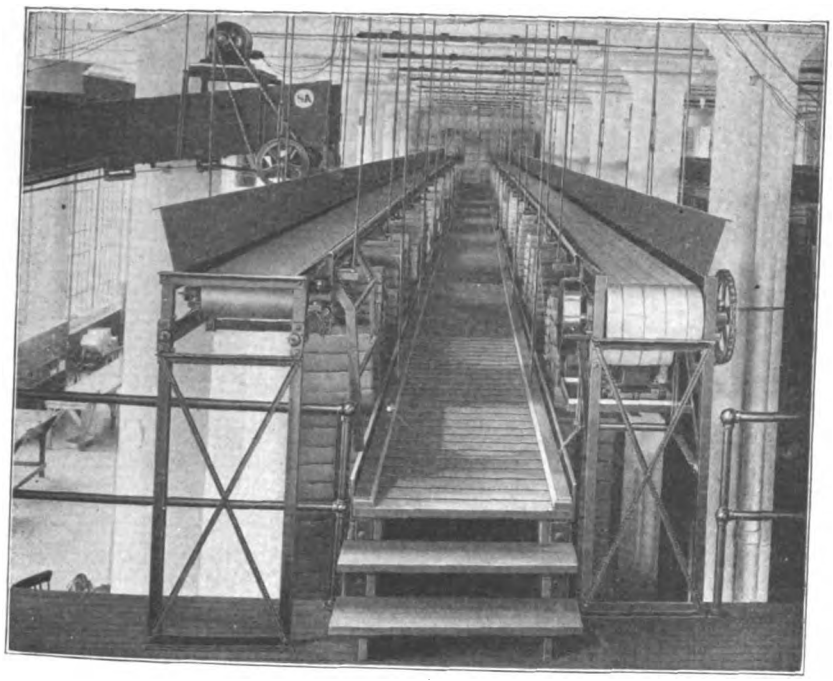
"The field notes obtained during the flights, together with the photographs, have enabled us to obtain a comprehensive idea of the Fraser Valley situation, and have placed us in a position to make concrete recommendations dealing with the control of the pest."

During the season of 1921 seaplanes from the Vancouver station of the Canada Air Board were used to assist the geodetic survey in locating suitable triangulation points in the mountainous section of British Columbia. In this way the surveyors were enabled to

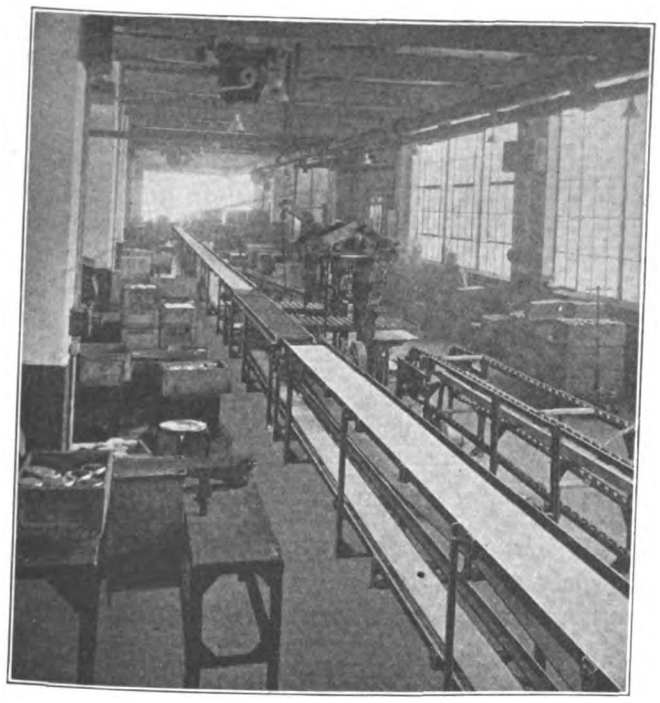
(*Continued on page 54*)

Digitized by Google

SURPRISE YOU---INDEED



National Cloak & Suit Company installation



American Can Company installation

it will surprise you to know what it has actually cost you to handle your materials in the past year. To get just an idea of the money which is being wasted through lax methods of handling materials in your plant go into each department starting in the receiving and finishing in the shipping. Make notations of the methods used, amount of time consumed to carry articles to and from given points and draw your own conclusions as to why your handling costs are high.

Conveying Systems Solve Handling Problems

We will gladly make an analysis of your handling problem and submit design of a conveying system particularly adapted to your individual conditions which if installed will reduce your costs, increase efficiency of your organization and enhance your production.

Resolve immediately that your 1923 handling costs will be substantially reduced and to get action communicate with us immediately.

SAMUEL OLSON & COMPANY

2418-26 Bloomingdale Ave
CHICAGO ILLINOIS

5th Ave. Bldg.
NEW YORK CITY, N. Y.

Digitized by Google

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Control

The SIX SENSES
Seeing ~
Feeling ~
Hearing ~
Smelling
Tasting ~
and ~ ~
Tycos Temperature Control ~ ~

If Sense of "sight" satisfied the steel makers!

WHERE molten metal runs and splashes like milk—where the fierybroth shifts its flame-tints through violet, orange, pink, white and blue as it is "seasoned" with carbon, ferro-manganese, tungsten, ferosilicon or vanadium—the practice in years gone by was to gauge the proper pouring temperature by overseeing the colors with the naked eye. The expert peered into the maw of that inferno, protected by colored glasses, and when he judged the time was ripe—out leaped the frenzied stream into the incandescent ladles! The result might or might not be good steel, of the proper grade for the purpose intended.

But today nothing is left to chance. Nothing is left to the sense of sight unaided, to guesswork or the human element. No. Today the accuracy of Tycos Pyrometers and other Tycos Temperature Indicating and Recording Instruments furnishes that vital "sixth sense" which enables workmen to know exactly the temperature of the furnace even though it mount higher than 3,600 degrees F—and to control it absolutely, some by the radiation of heat rays, some by direct current.



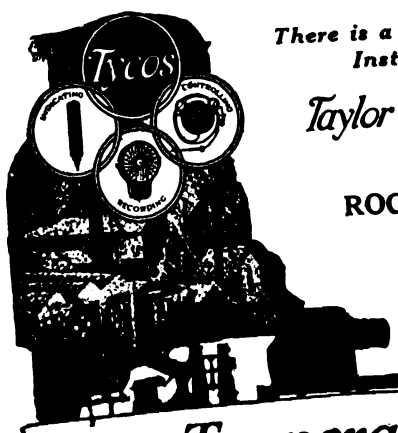
TYCOS OPTICAL PYROMETER

Tycos Instruments take the steel plant out of the realm of rule-of thumb and the blundering of the blacksmith. Briefly, whatever is made of iron or steel, by any process, depends upon this Tycos "sixth sense" of temperature control for efficient service and for production by the least costly method.

And for every process involving such heat control and heat treatment thereis a type and style of instrument in the Tycos line, embracing as it does over 8,000 types and styles.

MANUFACTURERS

What is your problem of applying this "sixth sense" to your plant? What do you make? Write us and literature on any instrument or type of instrument will be sent you promptly. Tycos experts are ready to advise on its application to your plant.



There is a Tycos or Taylor Temperature Instrument for every purpose

Taylor Instrument Companies

Main Office and Factory
ROCHESTER, N. Y., U. S. A.

Canadian Plant
Tycos Building
Toronto, Canada

Tycos Temperature Instruments
INDICATING · RECORDING · CONTROLLING

(*Continued from page 52*)

select the most suitable mountan peaks by examining the topography of the country from the air. The engineer in charge has stated that by the use of aircraft fully three years' time was saved in addition to the elimination of a great deal of painful and laborious work which would otherwise have had to be done on foot. In addition aircraft were also employed in assisting members of the geological survey, particularly in Northern Ontario. Large areas of the country are of granite formation and others are covered with heavy glacial deposit. By the use of aircraft the geologist can eliminate these areas in advance and therefore devote his time to a more detailed examination of more promising territory, thus saving much time and effort.

Seaplanes have also been used in connection with the reconnaissance of flooded areas for reclamation work in Manitoba. The hydraulic engineer in charge of the Carrot River reclamation scheme in that province reports in part as follows:

"I cannot speak too highly of the benefits derived from a flight of this kind in connection with survey work on a project of the magnitude of the proposed Carrot River Triangle Drainage Project, involving as it does an area from 800,000 to 900,000 acres, a large part of which is practically inaccessible in the summer season on account of the flooded condition of the interior. Much of this district is unsurveyed and very little information of the topographicad features of this section is obtainable without running a traverse survey. From the air you can see the various drainage channels in the interior quite distinctly, and information of this kind would prove of great value in determining to a large extent where it would be necessary to run our interior traverse lines and where lines would not be necessary, thereby saving time and money."

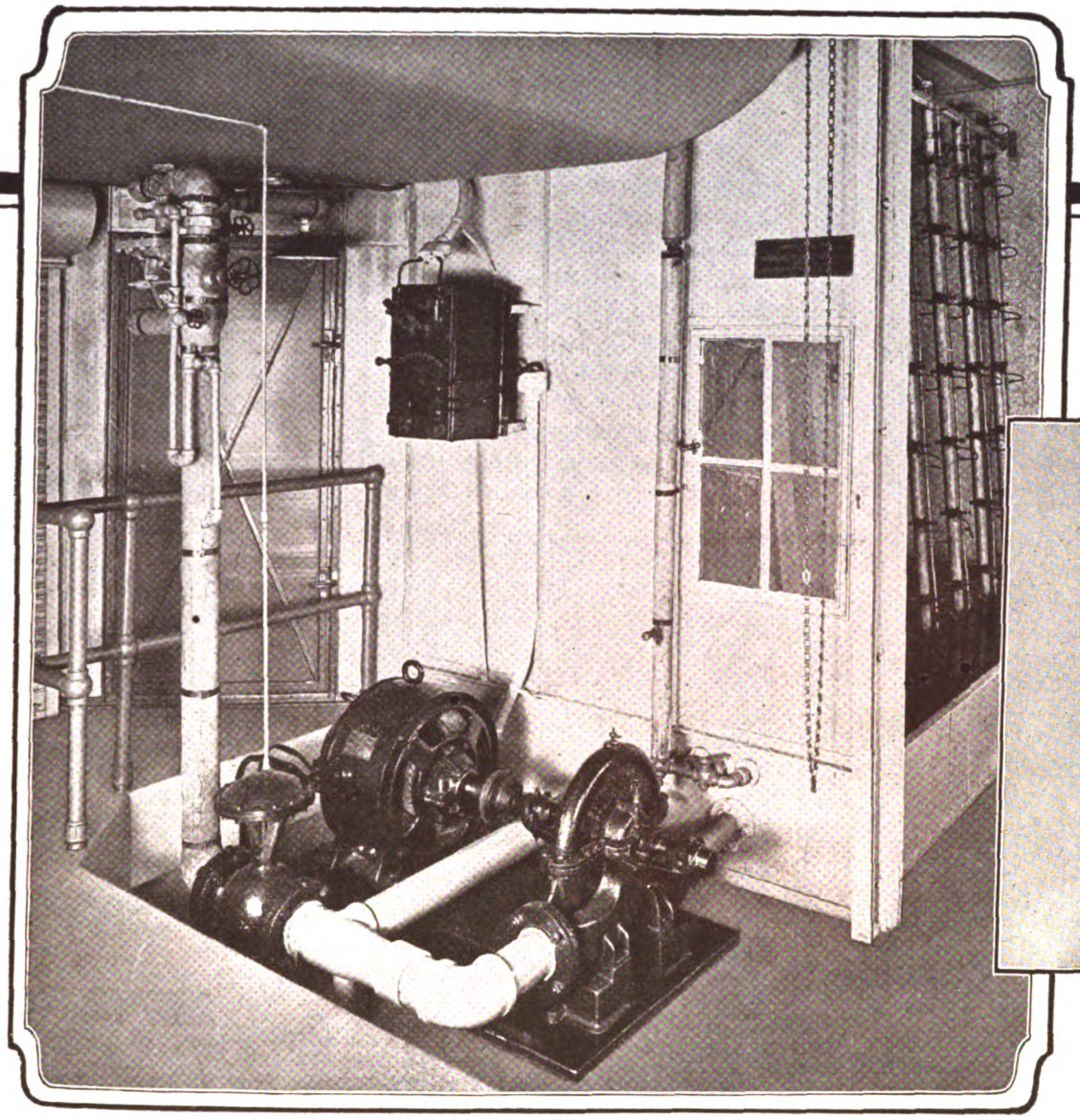
Another field of usefulness for aircraft has been found in the detection and apprehension of smugglers. There has always been a considerable amount of smuggling taking place through the port of Vancouver, particularly as regards illicit drugs as they are capable of being done up in such small packages and are of such great relative value. One method of smuggling consists in the smuggler throwing the packages containing the drugs overboard just before the ship comes into the harbor. The spot is marked, and the smuggler subsequently returns with a small boat or launch and picks up his valuable flotsam. But now the trans-Pacific lines are met some considerable distance out of port by seaplanes containing revenue officers. They escort the ship into her dock circling round and round her the while. In this manner attempts to throw drugs or other smuggled articles into the sea are frustrated; and in a number of cases smugglers have been caught in the act and apprehended.

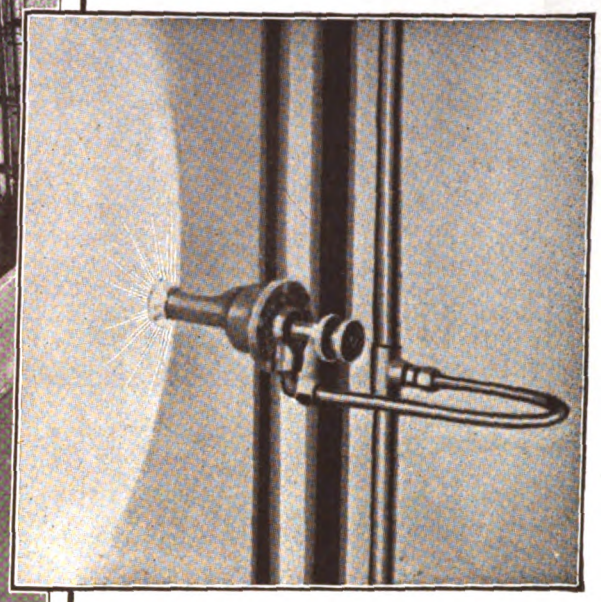
Seaplanes have been found useful, too, in connection with the enforcement of regulations concerning closed seasons for fishing. In a more direct manner they have been of value to the fishermen by indicating the presence of schools of fish which might otherwise have been allowed to pass without leaving their toll within the nets of the fishermen.

These are by no means the only uses which have been found for aircraft by the civil government flying department, and more are being discovered as experiments are conducted in other fields. While these activities are all confined to the uses of government departments, the mere fact that the value of aircraft in these various connections is being demonstrated by the Air Board in this way cannot fail to assist in the development of flying as a commercial proposition. The Air Board is always careful not to enter into competition with private individuals who wish to undertake any phase of commercial aviation, but rather is willing and anxious to assist private fliers in every way.

There is little doubt that the eventual establishment of commercial aviation upon a stable basis, at least in Canada, will be due in no small measure to the efforts, past, present and projected, of the civil government flying department of the Canada Air Board.

Digitized by Google





The above illustration shows the wide spread of the blanket of mist as it comes from the spray nozzle.

The air washer is shown to the right in the larger illustration.

Distinctive Service In Air Washers

Air that is properly humidified, cooled, and as clean and pure as a mechanical process can make possible, is a certainty with the American Blower Air Washer.

It's because of the special design of the spray nozzles of the American Blower Air Washer that the impurities are removed from the air passing through this air purifying system.

These spray nozzles produce a heavy blanket of mist so finely divided as to literally form a dense cloud through which every atom of air must pass, causing it to be cooled, humidified and purified.

The automatic flushing feature of these nozzles provides a means for keeping them clean and insures continuous operation at a maximum efficiency.

If you have a ventilating problem bring it to the attention of our engineers. Many years of practical experience enables them to cooperate with you.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO CO., LTD., WINDSOR, ONTARIO

(217)

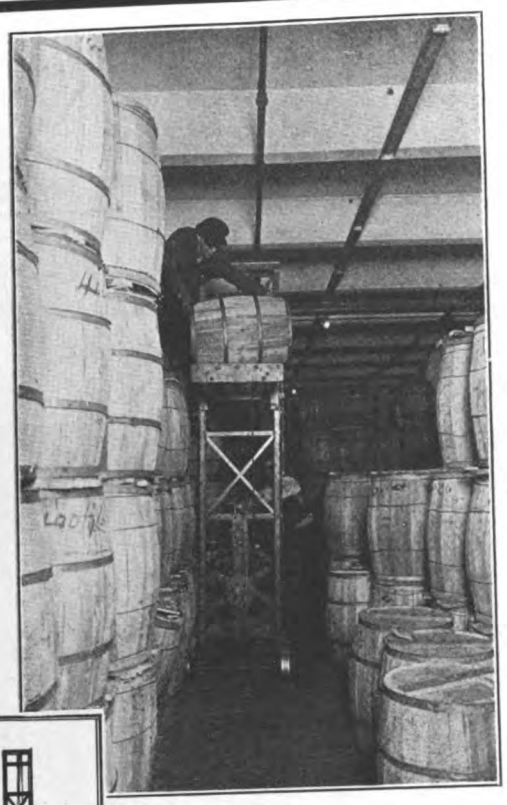
American Blower

"Sirocco" TRADE MARK

EXHAUSTERS · VENTILATING FANS · AIR WASHERS · BLOWERS · ENGINES

FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

Digitized by Google







Turn Waste Space into Storage Room

This portable elevator can work with the greatest ease and facility in close quarters and narrow aisles.

Heavy packages and loaded barrels are easily stacked and piled and it takes but two men and a few simple motions to do the job.

The portable elevator has the following features:

- Reversible flat and roller platform
- Lever for raising and lowering top section
- Quick speed lowering device
- Automatic brake
- Ability to lower on hoisting spindle as well as quick speed
- Cut Gears
- Ball bearing wheels
- Rugged construction throughout

Electric machines have regular hoist type motor, line switch, reversing controller, upper and lower limits, heavy silent chain drive

For the first time hitherto wasted space can be turned into good storage room at very little cost.

Send for booklet describing this remarkable portable elevator.

Ask for catalog 103A

Three Simple Operations

1. Package loaded directly on elevator platform.
2. Raises load to top or any desired height.
3. Placed in position on pile.

NEW JERSEY FOUNDRY & MACHINE CO.,
90 West Street, New York C

What's in a Name?

(*Continued from page 25*)

equipment and I am sure if they will look at their tiering machines as portable elevators they will increase their usefulness. It is possible by slight alterations to make the standard makes of machines fit numerous places and it will be found cheaper to do this than it would be to design and build an entirely new machine. Some



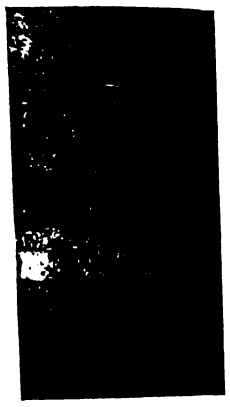
of the Tiering Machine manufacturers are already inferring that their tiering machines are really portable elevators; but it is hard for them to change the name, the same as it is hard for a fond mother to get over calling a six foot man "Sweetie." Look at the equipment and the photographs and determine for yourself which name applies and describes the uses for the equipment best—Tiering Machine or Portable Elevator?

Washington, D. C.—The slate industry, an important source of roofing, blackboards, billiard-table tops, and other more or less essential products, labors under a staggering handicap of waste, states the Bureau of Mines, which has completed a study of the subject.

Slate makes such durable and attractive roofing that its use should be greatly encouraged, the Bureau of Mines considers furthermore, its noninflammability as compared with wood adds to its value, for the most frequent cause of dwelling-house fires in the United States is said to be sparks from a chimney alighting on a wood-shingle roof.

Uhl Steel PosturChairs Increased Production 10%

for some workers in a Boston publisher's bindery. Fatigue is decreased by the perfect adjustment possible with this chair to the individual seating condition.



This chair supports the body where support is needed and eliminates preventable fatigue.

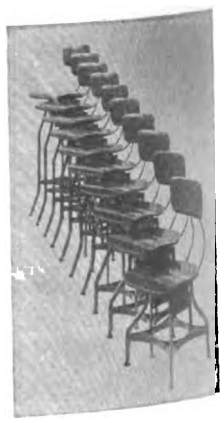
The PosturChair is designed to fit the seated body. It encourages good posture and makes it the comfortable position. It has been designed by experts in seating. It is approved by a nationally known health organization—the American Posture League, and each chair bears its label.

It is a piece of production machinery and as such is being adopted by large employers of labor everywhere.



There is only one right way to sit. The seated skeleton tells the story.

Special Features: Made of cold rolled steel except seat and back support which are of wood. 10 heights, each with 3" height adjustment. Seat tilts forward or backward. Back support, swivel and adjustable in height. Durably constructed, neatly finished.



There is a style and height to meet any working condition.

The Toledo Metal Furniture Co.
1600 Hastings St. Toledo, O.

Manufacturers of steel equipment for factories, stores, offices and schools.

TRY ONE AT OUR RISK

If you are seeking more production and greater health protection for your workers, write us for a sample to try under your own conditions. It's free for two weeks use. Mention height needed. Descriptive pamphlets available.

Digitized by Google

Modern Factory Floors and Their Maintenance

(*Continued from page 21*)

the other as these things always do.

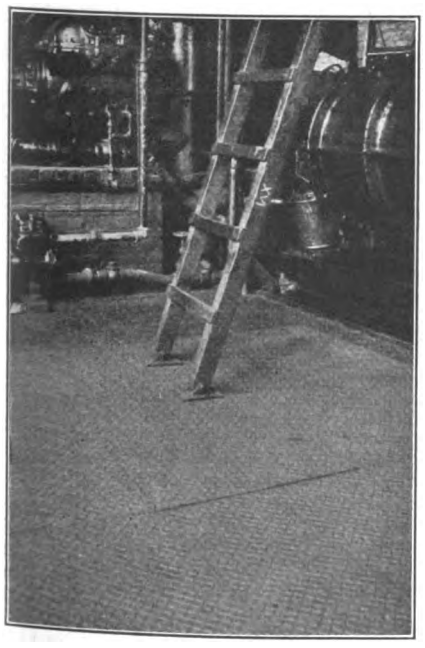
But concrete is not a comfortable floor when one has to stand upon it for long periods. Thus research and ingenuity began to look about for preparations or materials that would provide the flexibility, heat insulation, damp-proofness and comfort of the old wooden floor, while still retaining the rigid durability of concrete. The answer in a good many cases has been in the nature of compromise with concrete as a sub-floor or foundation, and with wood planking, wood block, bituminous sheet or other tread surface. So today the factory manager has a wide choice of admirable materials that will provide comfort as well as strength, and at the same time present an exceedingly attractive and neat appearance. Our first three illustrations, for example, show applications of the same make of flooring to widely different purposes in office and production departments. The power plant and factory department of today is entitled in the estimation of the modern factory manager to as much if not more consideration in the matter of floors than is his office.

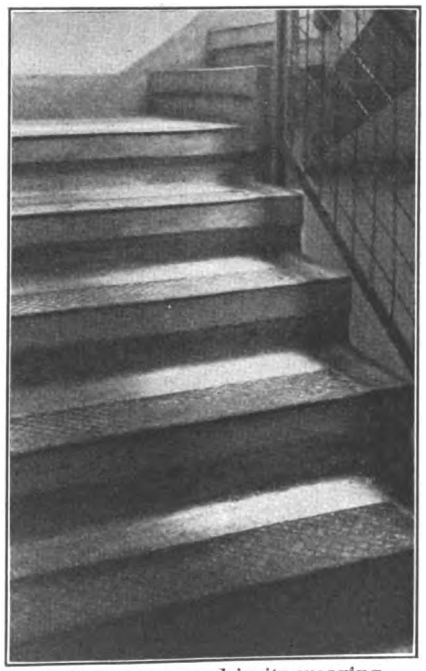
Naturally, this policy costs money. An old style factory manager or shop man would stand aghast at the cost of the modern factory floor. But if he were educated, to regard his floor as an investment in daily transportation, his views would rapidly change. Cost is high or low depending on what you get for it.

The old style factory floor had but two principal requirements. It had to be level enough to make it possible to pile things upon it, and it had to be strong enough to keep workmen and work from falling through it. The modern factory floor, on the contrary, has a long list of requirements which of course vary in individual importance with the conditions that are encountered. It must be rigid and free from vibration, damp and dust proof, an insulator for heat (for coal costs money), it must be long lived under severe usage, able to carry heavy loads concentrated upon truck wheels, it must resist abrasion, it must be comfortable to the workers' feet; resilient. In some cases it must be acid-proof and have high dielectric qualities. And it must be of such a nature that a part of it can be renewed when required, without renewing the entire surface.

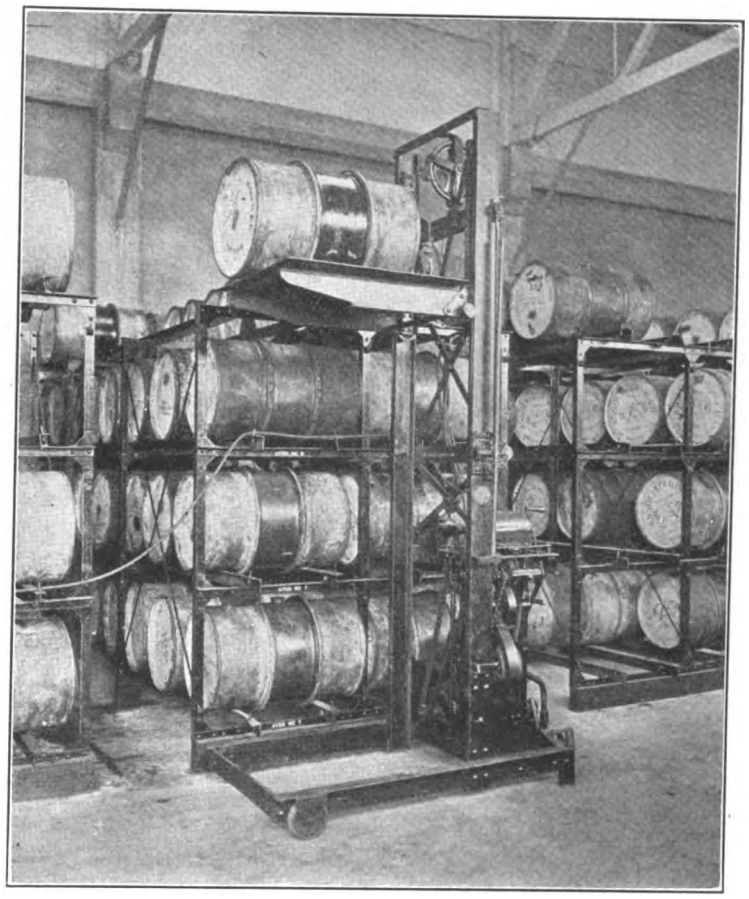
Block floors composed of wood or asphalt are found in a large number of factory de-

(*Continued on page 59*)





A combination of iron plate, with abrasive grit incorporated in its wearing surface at the time of casting, is known as "Feralun." These two views show it in two different applications.



Economy System of Storage Handling

PROFIT FROM EVERY INCH OF SPACE



Making up a difference in floor levels at the Hygrade Lamp Company's plant.

In every industry millions of dollars are wasted annually in unused space and excess labor.

Your own plant may be no exception and probably contains unutilized space which could show a profit instead of a loss.

The Economy Barrel Storage Racks installed in one of the warehouses of the Associated Oil Company of California (note illustration above), and the Economy Electric Portable Elevator shows how this company has made use of space formerly unused instead of building additional warehouses.

The advantages the photograph illustrates are:

1. Labor is saved.
2. Storage capacity increased
3. All grades of oil made readily accessible.
4. Leakage, where barrels are used, is prevented by the weight being taken off lower tiers.
5. Order, cleanliness and safety promoted.

Write for a copy of "SAVING WASTED MILLIONS." In it you will find many suggestions and illustrations of Economy Storage Handling System. It does not obligate you in any way and will open up to you a new way to reduce handling costs, save labor and utilize wasted space.

ECONOMY ENGINEERING CO.

CHICAGO
2663 W. Van Buren St.

NEW YORK
342 Madison Ave.

Digitized by Google



HAVE YOU A FLOOR WHICH IS BADLY WORN?

One of the qualities of Marbleloid *permanent* Flooring is that it can be used for re-surfacing old worn-out wood and concrete floors.

This composition flooring is laid plastic over the old floor and in a few hours you have a strong, warm, smooth-surfaced, modern floor which adds much to the appearance, serviceability and permanence of your building. This Marbleloid Floor will not dust or chip, will be found certain and elastic for walking and will not require any expensive upkeep. It will also prove non-abrasive, a quality most desired in industrial buildings where machinery is installed.

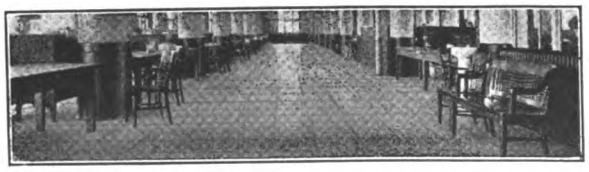
MARBLELOID

The Universal FLOORING for Modern Buildings

We install each Marbleloid Floor as well as manufacture the material and we will *guarantee it* to please you in attractiveness, longevity, warmth, strength and in all other qualities we claim for it.

If you have a worn floor in your building let our engineers tell you the cost of transforming it into a modern, fireproof and durable Marbleloid Floor—or if you are erecting a a new building be sure to investigate the suitability of Marbleloid for its floors.

Use coupon below if you want an advisory estimate or copy of our 32 page floor book.



The Marbleloid Co., 467 8th Ave., New York

THE MARBLELOID COMPANY, New York City: Without obligating myself in any way, please submit tentative estimates on the cost of your product installed complete for our building.....; below are the approximate areas involved.

Floor.....Sq. Ft. Sanitary Base.....Lineal Ft.

Wainscot.....Sq. Ft. I have checked the floor troubles we now have.

Our floors are

[ ] New Concrete [ ] Cement Finish [ ] Wood

[ ] Cracking [ ] Cold [ ] Slippery
[ ] Dusting [ ] Splintering [ ] Unsanitary
[ ] Noisy [ ] Rough [ ] Rotting

Name .....

Firm .....

Address.....

[ ] Illustrated Booklet



OWNERS OF PILING MACHINES

REGARDLESS OF TYPE

OUR model "K" attachment can be applied to your hand operated portable elevator, no matter what type it is. It adds another service to your machine and does not interfere with the hand operation. Can be run from ordinary lighting circuit. It makes the machine run faster and is instantly available for use in any place. Indoors where electric current is handy, just plug into lighting circuit and let the motor do the work. Outdoors, or at any place where power is not available, use the hand crank. No adjustments, no changes—motor or hand power at the will of the operator. We are prepared to convert hand machines of any type into combination hand and motor, without delay.

The Revolvator shown in the cut above is a combination machine—hand or motor operated—with a revolvable base.

Write for bulletin E64—today.

REVOLVATOR CO.

311 Garfield Ave., Jersey City, N. J.

Just Suppose--

You had coming to you every month a big bunch of Pictured Progress such as you see in this copy of

INDUSTRY ILLUSTRATED

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And ***wouldn't*** it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name.....

Mailing Address.....

Company.....

Position.....

(Important confidential information—for our own records only)

ANNUAL SUBSCRIPTION $1

In Canada, $1.25; Foreign, $1.50

Digitized by Google

(*Continued from page 57*)

partments. The success of the *wood block* as a street-paving material has no doubt been responsible for this development. The success of any wood block floor depends upon the rigidity of the individual blocks. If these remain tightly and firmly in position they will wear indefinitely. If they become loose under wear and tear they will disintegrate rapidly. It is also very essential that they be uniformly supported; usually they are installed on a concrete base and bedded in bituminous material. Bituminous filler is also poured between the intersticies.

The manufacturer of *asphalt blocks* from crushed stone and Trinidad asphalt has steadily increased until it has become a national industry. These blocks are pressed into form in powerful mechanical presses. Asphalt blocks are in extensive use for street paving and are now coming into general use as a shop floor. Such a floor is fireproof, comparatively noiseless and, being made of a trap rock composition, always presents a gritty non-slippery surface. It is adaptable to many kinds of foundation, preferably concrete with a thin mortar bed between the concrete and the asphalt blocks. For an absolutely waterproof construction, layers of asphalted felt may be placed between the sub-floor and the mortar bed.

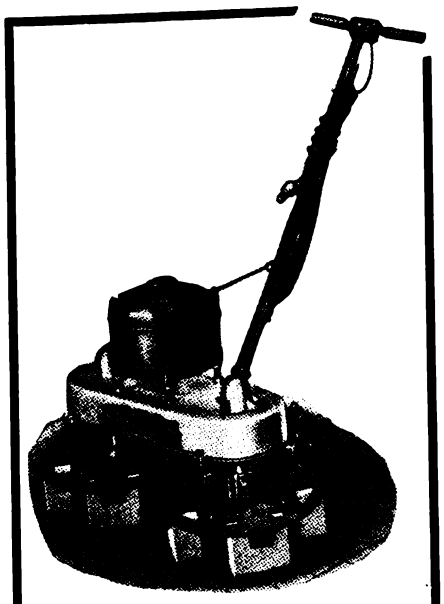
Monolithic plastic floors have reached a high state of perfection. They are laid in a plastic condition and hardened or set into seamless tough bodies which offer neither joints nor crevices for the accumulation of germs or moisture. Prominent among such floors are those based on *magnesite* and known to the building trade under the term of composition flooring. Such material adheres firmly to wood, concrete or iron and may be installed over old flooring as well as upon new construction. The formula of the composition of these floors varies according to the service required. One advantage of using a magnesite base is in the possibility of securing almost any color or finish desired. This feature is appreciated in offices, show rooms and power plants perhaps more than in the production department of the factory.

Monolithic floors made up of an *asphalt base* are also common. Such flooring is made of a mixture of Trinidad Lake asphalt and mineral filler and is trowelled while hot over any type of old flooring to a thickness of one and a half to two inches. When the composition cools and is ready for use it presents a resilient, durable water and acid proof monolithic sheet without cracks or crevices.

An interesting development of recent years is that of *fibre flooring* which is produced as a by-product by one of the largest American shoe manufacturers. The origin of this flooring was in the large quantities of waste material resulting from the operation of tanneries and shoe factories. As a result of this, after several years' experience and test, leather fibre is now produced and on the market rolled into sheets and ready to lay over a suitable foundation. Some of the desirable features which are claimed for this flooring are noiselessness, resiliency,



Digitized by Google



FLOOR FINISHING MACHINES

These improved Schlueter Machines will really make your floors show up on the profit side of the ledger. They pay for themselves in the cost of labor they replace, and the amount of time they save. They are very simple to operate; they need no special operator. A trial will convince you of their advantages.

ABOVE The machine pictured above is for use on all kinds of stone floors or for sand papering floors of wood, cork or composition. Can be used for *scrubbing*, or *polishing*, or any kind of treatment. The discs are directly connected to the vertical driving shaft and revolve in opposite directions. No spot on the floor is missed.

The principal parts of the machine are covered so that there is no possible chance for grit or water to come in contact with motor, sprockets, gears, ball bearings, etc.

In operation it is very easy to guide, and as it is self-controlling it gives the operator time to treat the floor.

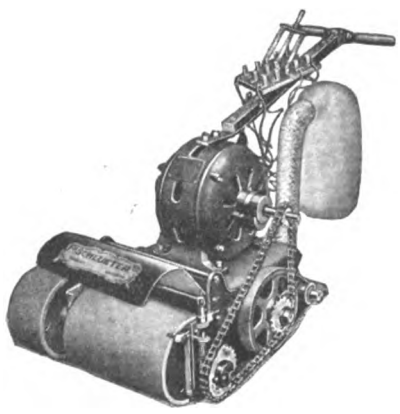
BELOW This machine gives a perfectly smooth finish to wood and cork floors. It is so constructed that it will surface close up to baseboard or wall without use of EDGE ROLLER.

The special feature of our machines is that they do not require the use of levers; the machine moves forward automatically when the operator raises the handle.

Thousands of these machines are in use all over the country. Perfect results are guaranteed. We assume all responsibility

Send for our prices and free trial proposition.

M. L. SCHLUETER
235 West Illinois Street, Chicago



non inflammability and non-conductive qualities. It is said to resist wear to the extent that the feet of sharp shod horses make no impression on it.

Concrete, as has been said before, is as good a material as one can find for the average sub-floor or foundation. In many cases, particularly where workers do not have to stand upon it, concrete properly surfaced and hardened is quite suitable for the tread surface. It must be properly protected, however, for no matter how well laid, if left unprotected, it will eventually crumble and gradually wear down. On this point we quote an extract from the *Maintenance Engineer* for November-December, 1921, published by the Truscon Laboratories.

"A complaint often lodged against concrete floors is the fact that they dust and sand —that they are hard to keep clean. The more sweeping done, the more dusting.

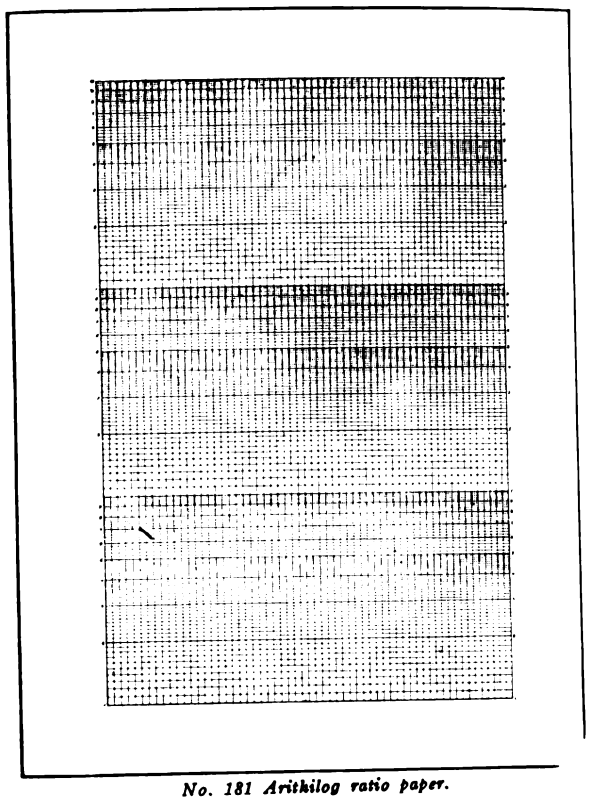
"This cement dust, being very fine and abrasive, sifts and filters into everything, and is especially destructive when it becomes lodged into moving parts of machinery. In time this dust may become serious in its consequences to the floor, resulting in such a weakening of the wearing surface as to cause crumbling, and the formation of holes and ruts.

"The baffling part of this process of sanding and disintegration is that all floors do not wear alike—that given conditions of equal and of the same kind of wear, there will be a big variation in the way two floors may stand up in comparison. Two floors, having been laid by the same contractor at practically the same time, using the same material, with all other conditions apparently being equal, may be of such divergent character that one floor, subjected to very hard wear, might give better service than another subjected to relatively light wear.

"While cement requires relativly but a very small amount of water for its actual hydration, in practice a very large amount of water must be used in order to obtain its proper consistency for the processes of pouring, tempering, etc. The amount of water is variable on the

(Page 62)

EDEXCO CHARTING PAPERS
for putting BUSINESS RECORDS in GRAPHIC FORM



No. 181 Arithilog ratio paper.

1. They are printed on letter size paper, so that they are easy to file in letter files or bind up with typewritten reports.

2. Wide margins are left around engravings for insertion of scales, headings and notes. They are printed on white (on one side only) in a color of ink which reproduces readily.

3. They are printed on a paper which is strong enough to stand hard usage but which is unwatermarked and transparent so blueprints can be made.

4. Most EDEXCO sheets are specially divided for plotting business data by days, weeks, months and years and contain the right number of spaces for this purpose. EDEXCO curve cards also embody all these features.

TWO WEIGHTS

carried in stock for immediate delivery.

We also sell books telling how to use these papers. Our catalogue "H" describing these is free.

LABORATORY OUTFITS

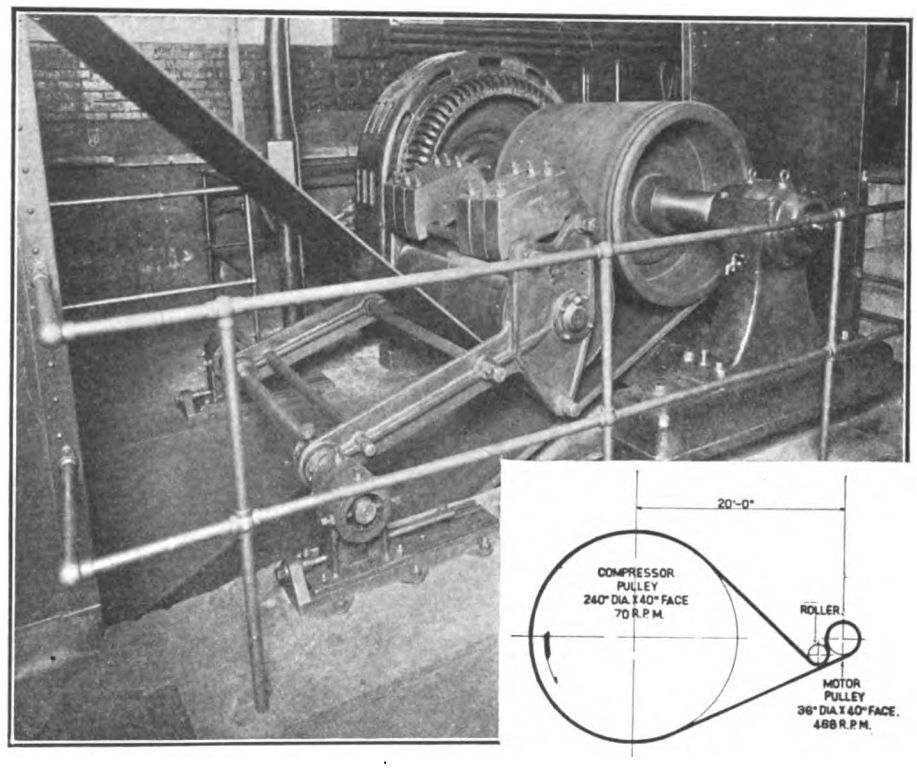
Containing instruction pamphlets and charting paper to experiment with:

OUTFIT No. 3, on General Business Charting. $2.00
OUTFIT No. 4, on Semi-Log or Ratio Papers. $2.00

Shall we send you one or both?

Educational Exhibition Co. Graphics Headquarters
627 Custom House Street, Providence, R. I.

Digitized by Google



500 H.P. Motor Driven Compressor
Motor Pulley, 36" dia., 40" face, 468 R.P.M.
Compressor Pulley, 240" dia., 40" face, 70 R.P.M
Double Leather Belt, 39" wide, 7/16" thick

The Electric Drive—and the LENIX

Five Points

1—The Lenix increases the arc of contact between belt and pulley.

2—The Lenix maintains, constantly and accurately the proper tension in the slack side of the belt.

3—The Lenix saves floor space, building space and belting because of freedom in pulley locations.

4—The Lenix saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The Lenix permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

In changing a mill over from mechanical to electric drive there are usually several places where the LENIX will produce far better results than an ordinary belt drive.

In some cases it is practically the only type of drive that can be used. This is due to the fact that the LENIX permits the motor to be placed in any position in any plane without the least sacrifice to the efficiency of the drive.

But in all cases, by permitting short centers between motor pulley and driven pulley the LENIX saves valuable floor space. At the same time by "wrapping" the belt around the pulley (see illustration) a greater arc of contact is secured. More power is delivered. Belt slippage is practically eliminated.

There are more than 3,000 LENIX drives in operation in this country. There would be some in *your* mill if you were familiar with the advantages of this drive. You can get the facts by writing for a copy of "Saving Slippage and Space."

F. L. SMIDTH & COMPANY
ENGINEERS
50 Church Street, New York

The LENIX Drive

Digitized by Google

THE SEAT OF
Production



No. FS-22 Patented Adjustable Legs and Back-Rest.

In the nation's foremost manufacturing institutions, "Royal-Chicago" Seating is not only increasing production daily, but also the quality of the work and the loyalty of the workers.

Being scientifically designed to eliminate unnecessary fatigue, no amount of welfare work can possibly equal the practical results this seating has.

If you are not using "Royal-Chicago" chairs and stools now, it will pay you to investigate.

Royal Metal Mfg. Co.

MAKERS OF

"Royal-Chicago"

PRODUCTS

The Correct Industrial Seating

2312-24 S. Western Ave.

Chicago, Ill.



FS-15 Patented Adjustable

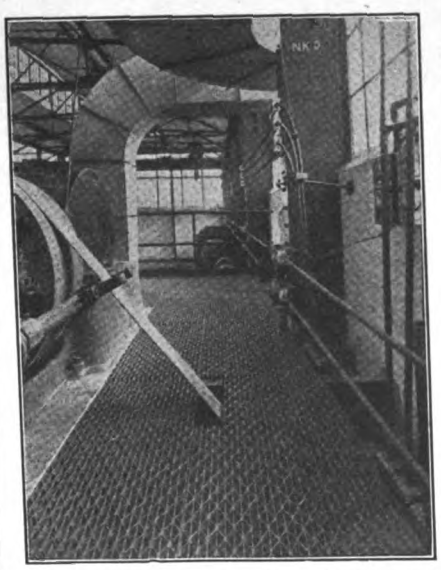
FS-14 Patented Adjustable

(Continued from page 60)

cement and other aggregates and atmospheric conditions.

"Where the skill and knowledge of the contractor's foreman comes in, however, is that although a large amount of water is necessary, an excess of water in a concrete floor is not desirable. Excess water makes the topping "sloppy," bringing the lighter particles, known as "laitance" to the surface. This "laitance" has very little binding or adhesive quality. It is one of the chief causes of the dusting of cement floors. Such a floor will dust even before it is worn; it may set so soft that the surface can be scratched off with the toe of the shoe.

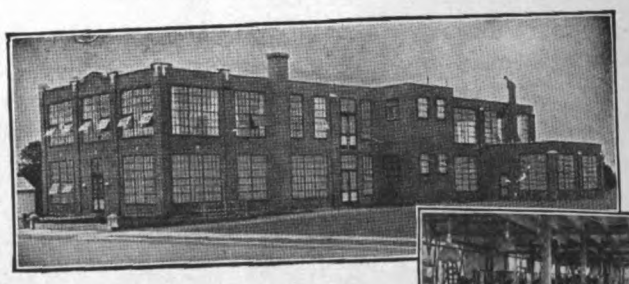
"Contrariwise, if too much water is not good for concrete or cement—then too little water is just as bad, because in that event the material has not the required fluidity to amalgamate the numerous particles into a compact mass —causing a weak bond.



For mezzanine and gallery floors, steel gratings are ideal, enabling easy access to all machinery, combined with safe footing and visibility.

"Again, the trowelling of cement is very important. The final trowelling should be done at just about the time of the initial set. This initial set may be any time from ¾ of an hour to 16 hours after the topping has been placed, depending entirely on cement and atmospheric conditions. A finish trowelled too soon will bring water and laitance to the surface, causing a dusty floor. If trowelled too late, it simply results in breaking down that crystalline structure which constitutes the initial set of the cement. If too much trowelling [illegible], we have again [illegible] of lait-

(Continued on page 65)





The Royerford Needle Works

erected in 47 days including entire mechanical equipment and installation of machinery.

—INTERIOR—

Your New Building

IT can represent every modern improvement and yet be built in 30 to 90 days at a big saving, if you use Beling-Bush standardized Buildings. Using our method, you save because of centralized responsibility and on cost of plans and specifications. Write for booklet and information, and let us estimate.

Minimum Cost *Maximum Service*

The BELING~BUSH CO., Inc.

FACTORY ENGINEERS AND BUILDERS

Drexel Building Philadelphia Pa.

"INSPECTION AND REGISTRATION OF STEAM BOILERS"

In fact, adoption of the A. S. M. E. code, etc., will benefit both manufacturer and user.

Another recommendation—one that we wish to make for the benefit of all users—is that the feed water level should be kept constantly at the proper point by the use of the Vigilant Feed Water Regulator. This will prevent coal from being wasted unnecessarily.

Our recommendation will tie in excellently with the movement now on foot.

This regulator is an absolute safeguard against explosions because low water is impossible with the Vigilant. There are no complicated parts to get out of order. And it cannot fail because it depends on gravity for its action.

Instead of putting your trust in the human element, install the Vigilant Feed Water Regulator. If only for the protection it affords, the Vigilant pays big dividends.

Write for the calalog today

The Chaplin Fulton Mfg. Co.

28-36 Penn Avenue

Pittsburgh Penna.

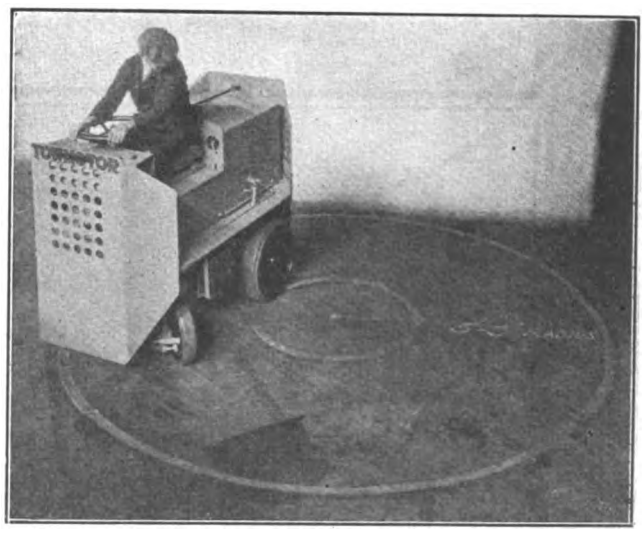
Sounds Good To Us

VIGILANT
Feed Water
Regulator



Digitized by Google

Every Day, In Every Way, Increasing Orders Show That



TOWMOTORS

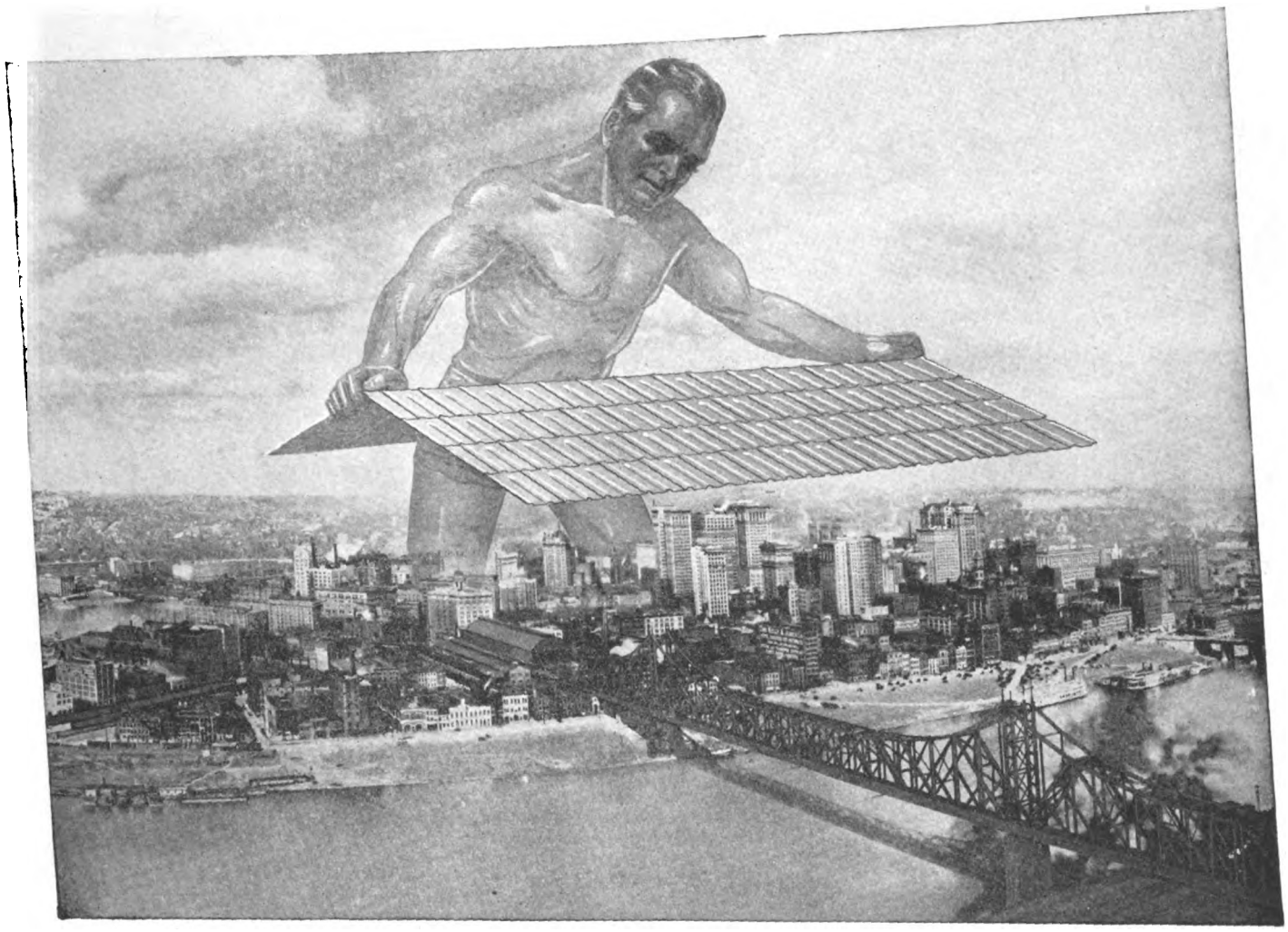


Are Justifying Their High Reputation For Quality, Economy And Service

THE TOWMOTOR COMPANY
1226 East 152d St.
Cleveland, Ohio

THE TOWMOTOR

Digitized by Google



In Dollars and SENSE—

You can estimate the economy of a Bonanza "Cementile" Roof in dollars and *sense*. For example—

You erect a fireproof building and expect it to last throughout your lifetime—perhaps forty years—and figure that it should remain standing another forty or eighty in all.

Assume your roof has an initial cost of $1200. With an ordinary roof there will be repairs due in one to three years, and an entire reroofing after eight years at the most. If Bonanza "Cementile" is used the one roof will be practically permanent; will, under ordinary circumstances, outlast the building itself, and there will be no expense for repairs.

40 ÷ 8 = 5. Multiply 5 by $1200 and you have $6000, plus the cost of repairs. A Bonanza "Cementile" Roof may cost a trifle more initially, although ease of laying generally brings the cost close to that of the ordinary roof. Let us place its cost at $1500. In other words $1500 against $6000, or a saving of 400%—during your lifetime!—and this does not take care of the repair bill inevitable with an ordinary roof!

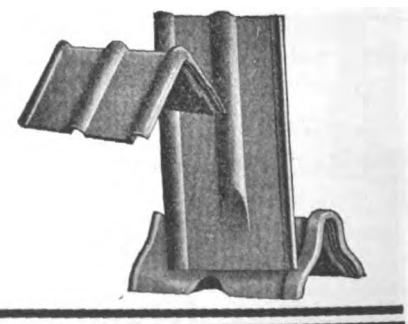
Which will you choose?

Our Catalog and Data Sheets will interest you; send for them today.

American Cement Tile Manufacturing Co.
831 Oliver Building, Pittsburgh, Pa.
PLANTS: Wampum, Pa. Lincoln, N. J. · Birmingham, Ala.
OFFICES: Pittsburgh · New York · Philadelphia · Cleveland · Birmingham

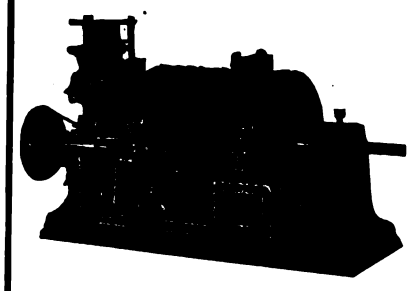
Bonanza "Cementile" is a reinforced cement tile roofing, with a pleasing outer surface, laid directly on the roof purlins. It is light, but very strong in structure, and absolutely fireproof and waterproof. Made for flat or pitched roofs, new or old.

The first cost of a Bonanza "Cementile" Roof is the last cost. We make and lay the roof, and unqualifiedly guarantee the material and labor.



Digitized by Google

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway New York

(*Continued from page 62*)

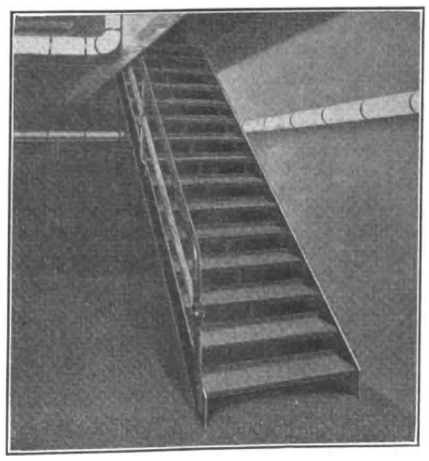
ance, due to water bringing only the lighter particles to the surface.

"Freezing, of course, is bound to cause damage and result in a soft, scaling floor, if not a defective structure. Such a floor may be a menace.

"The function of the sand and stone in concrete is to give compressive strength and wearing surface—the cement acting as the binder for holding the particles of sand and stone together. Naturally, if there is a lack of cement or a poor grade of cement, such conditions will result in a soft, crumbling floor. Again, if the sand is too fine or loamy, one will obtain a surface that is unable to bear up under the shock and abrasion of traffic.

"To recapitulate, we might list the probable reasons for soft, dusting cement floors, as follows:

Lack of cement
Poor cement
Poor sand (loamy—not sufficiently "sharp" or well graded)
Improper proportions cement and aggregate
Too much water
Not enough water
Drying too quickly (as in a steam-heated building, or exposed to direct sun's rays. All concrete and cement surfaces should be kept moist while hardening. This is very important.)



A factory stairway is usually a factory "hazard." Oil soaked slippery stairs cause many accidents. On these stairs, the treads and risers are of one piece rolled steel construction known as "Firmtread."

Trowelling too soon
Trowelling too late
Trowelling too long
Freezing
Using floor too soon (before surface has had time to harden and set thoroughly, which process requires from a week to three

MULLER ASBESTONE GUARANTEED PRODUCTS TRADE MARK

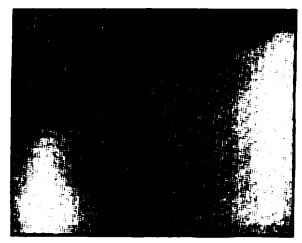
THE IDEAL Factory and Office Flooring



Wood While beautiful in appearance when first laid, wood soon wears out and must be replaced. In addition, it is inflammable, unsanitary and NOT cheap.



Concrete. The cheapest of all flooring, concrete is unsatisfactory because of its non-resiliency. It is very tiring to workers and furthermore is subject to "dusting."



ASBESTONE

This composition flooring is hygienic, fireproof, resilient and easy to the tread, this latter quality adding materially to the efficiency of workers. It costs only slightly more than wood and is much more durable. ASBESTONE can be installed over either old or new wood or concrete under-floors by cement finishers, or if desired, we are prepared to submit prices for completed installations made by our expert mechanics.

Full particulars, prices, etc., supplied free of all charge

FRANKLYN R. MULLER & CO.

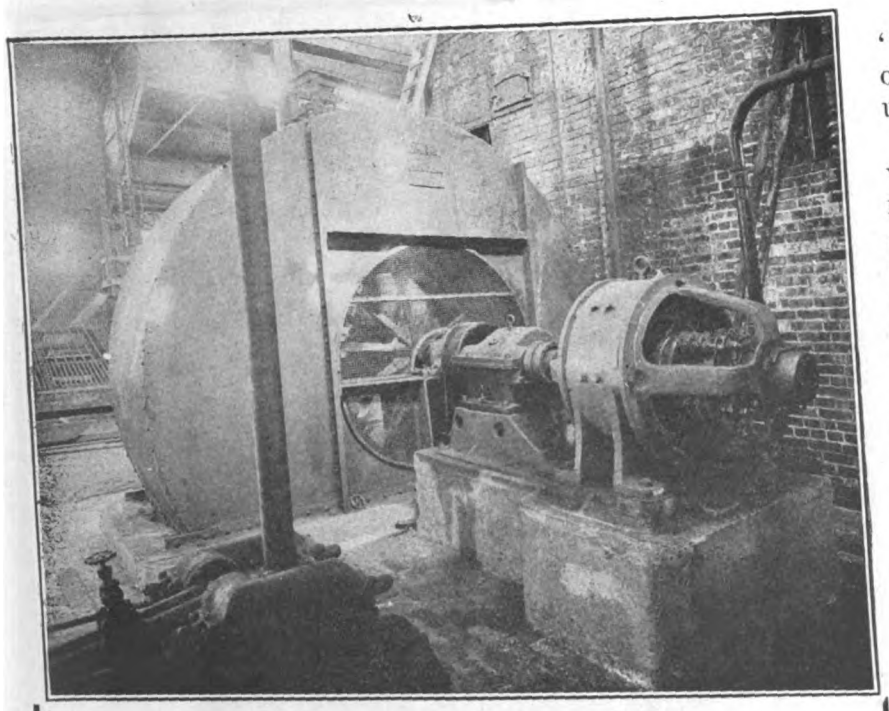
333 Madison St., Waukegan, Ill.

ASBESTONE

The best medium priced interior flooring known by modern science.

ESTABLISHED 1906

Digitized by Google



Better fans—better men

WHAT steam is to an engine, air is to a man.

A steam engine with half enough steam—impossible!

A man with half enough air—common!

Without considering the humanitarian side, viewed merely from a standpoint of dollars and cents, a high priced man deprived of good air and good ventilation is, like an under supplied engine, a bad investment.

Clarage Blower Systems keep your whole plant at just the right temperature during the coldest or the hottest days. Clarage systems cover every requirement—can be used for ventilating alone, or for heating and ventilating as well as humidifying. Regardless of the type or size of installation there is no deviation from the essential of good working conditions—a generous supply of air from out doors, uniformly supplied to every part of the mill, shop or factory.

Clarage engineers will place before you an unsurpassed accumulation of data covering ventilating systems of every type involving fan equipment. The scope of Clarage equipment is forcibly brought out by the booklet shown below. It covers the use of Clarage-Kalamazoo Systems for pneumatic conveying, for eliminating dust, dirt and fumes, for mechanical draft, as well as for ventilating, humidifying and air conditioning.



Write for it.

Clarage Fan Co., Kalamazoo, Mich.

New York City, Charlotte, N. C., Minneapolis, Cleveland, Pittsburgh, Detroit, Los Angeles, Philadelphia, Chicago, Indianapolis, Rochester, N. Y.

New England Elec. Equip. Co., Boston

CLARAGE KALAMAZOO FANS AND BLOWERS

weeks, depending on local conditions

"Any one, or any combination of these conditions may cause unusually soft, dusting floors.

"Having sketched briefly what might be considered the major reasons for the dusting and gradual breaking down of the surface of a cement floor, we will now take up in detail the various methods which have been successfully applied and are recommended for putting a cement floor in such shape as to reduce its dusting to a hardly perceptible minimum, at the same time enabling it to give real wear and service, even under the hardest traffic. Practice today recommends one of three methods for protecting cement floor surfaces, as follows:

1. Hardening chemically.
2. Hardening mechanically.
3. Surface film treatments.

"The first two of these methods perform the function of dust-proofing and crumble-proofing a cement floor through actual intrinsic hardening of the surface. The third calls for the application of a protective coating or film over the floor, such as varnish, enamel or the like."



Stair and platform surfaces should be considered in connection with factory floors. Those shown above are covered with carborundum filled rolled steel plates, known as "Mason Safety Treads."

Concrete as a floor foundation does not by any means stand alone or unchallenged in the field of modern building activities. A sub-floor known as *coal tar concrete* and embodying a base of coal tar has been in use for the past forty years. These sub-floors may be laid directly over earth and require no stringers or air spaces. They make fireproof construction possible with wooden floors by excluding all

(Continued on page 68)



STICKERS

Bright, snappy advertising stickers *that stick*—applicable anywhere to anything—economic and persuasive. Every business needs them. Also a complete line of Standardized Stickers ready for shipment in amounts from a thousand to millions. All kinds of labels.

Our price book in colors will save you money. Send for it.

ST. LOUIS STICKER CO. ST. LOUIS
1625 Washington Avenue

This Issue of Industry Illustrated

is Typical of the Broad, Interesting and Helpful Service it is Constantly Rendering.

ONLY the service is continually getting broader more interesting and helpful.

Wonderful as has been the array of timely articles and illustrations it has been presenting to its readers right along, from the very beginning, it is only beginning to scratch the surface of the immense possibilities that lie in the power of the camera to catch for the busy man vitally important and useful information that he would otherwise pass by.

Great things are coming. You will not want to miss them, even if, by any chance, you might think you can afford to miss them.

If you are already a subscriber, see to it that your subscription is renewed promptly. If you are not now on our lists for your own personal copy, put yourself there at once. See this coupon below?

—Mail this Coupon TODAY—

Industry Illustrated
120 West 32nd St., New York, N. Y.

Send me a copy of Industry Illustrated every month for a year. I shall remit on receipt of your bill—in the next 30 days or so. (If a renewal of a present subscription, check here.....)

Name.....

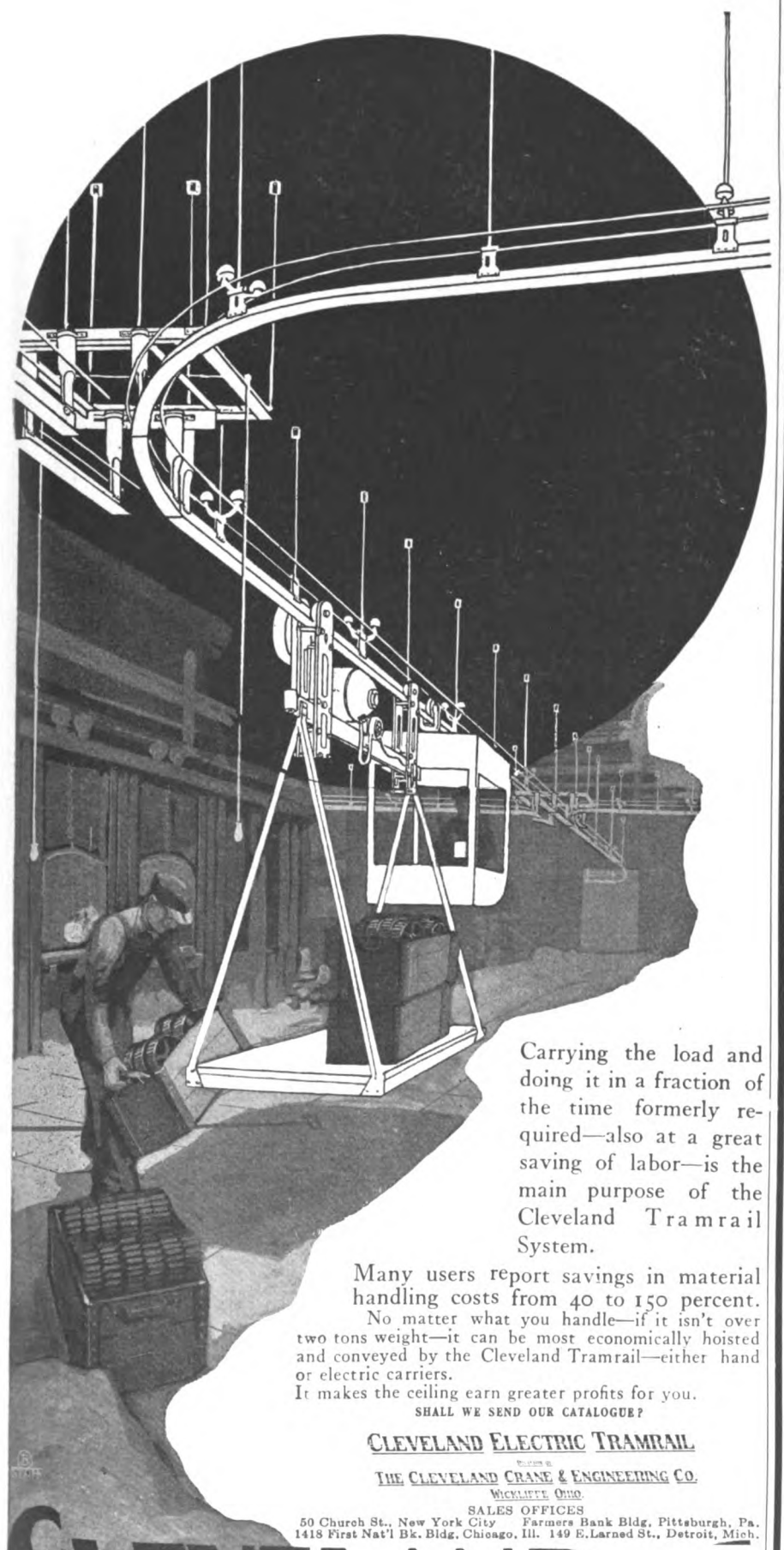
Address.....

Company..... Title.....

Annual Subscription Price, $1
In Canada, $1.25: Foreign, $1.50

(AD-L)

Digitized by Google



Carrying the load and doing it in a fraction of the time formerly required—also at a great saving of labor—is the main purpose of the Cleveland Tramrail System.

Many users report savings in material handling costs from 40 to 150 percent.

No matter what you handle—if it isn't over two tons weight—it can be most economically hoisted and conveyed by the Cleveland Tramrail—either hand or electric carriers.

It makes the ceiling earn greater profits for you.

SHALL WE SEND OUR CATALOGUE?

CLEVELAND ELECTRIC TRAMRAIL

THE CLEVELAND CRANE & ENGINEERING CO.

WICKLIFFE OHIO.

SALES OFFICES

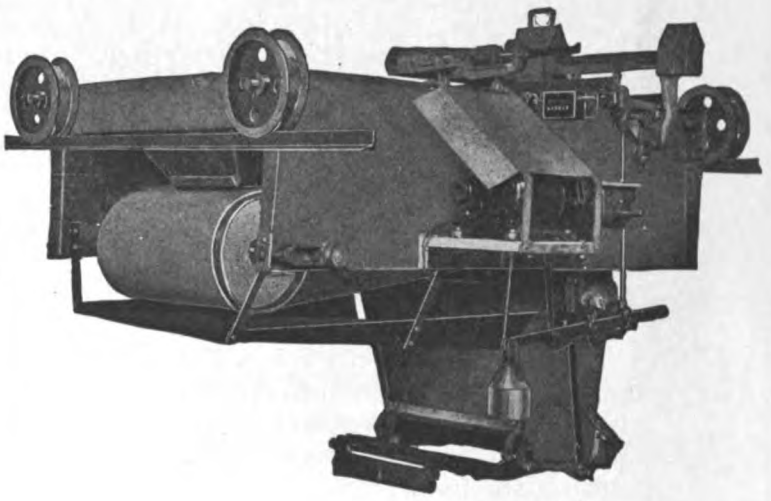
50 Church St., New York City Farmers Bank Bldg, Pittsburgh, Pa.
1418 First Nat'l Bk. Bldg, Chicago, Ill. 149 E. Larned St., Detroit, Mich.

CLEVELAND HAND OR ELECTRIC TRAMRAILS

65% OF POWER COSTS

FIGURED IN DOLLARS & CENTS FOR COAL

WASTING COAL IS WASTING POWER



THE RICHARDSON AUTOMATIC COAL SCALE

Keeps a close tab on the consumption of individual boilers.

ACCURATE, CONTINUOUS RECORDS AUTOMATICALLY REGISTERED

Soot, scale, holes in fire, faulty boiler linings, etc., all tend to lower boiler efficiency. Incomplete combustion results, and coal that might be transformed into heat units is lost up the stack or down the ash pits.

A RICHARDSON AUTOMATIC COAL SCALE locates the trouble in time for you to correct it.

USE A RICHARDSON

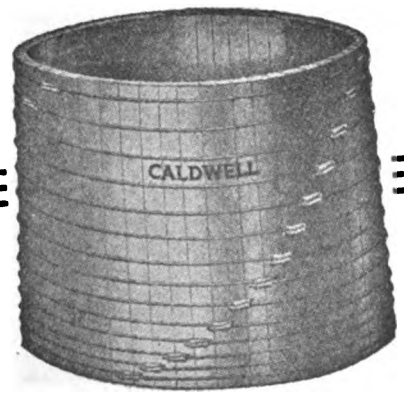
AND SAVE MONEY ON YOUR COAL BILLS

RICHARDSON SCALE COMPANY

Passaic, N. J.

New York Boston Buffalo Chicago Omaha Minneapolis
Wichita Memphis San Francisco

Digitized by Google



Records Speak Volumes

The unusual qualities of Caldwell Cypress Tanks are proven by their enviable records in all sections of the country. Perhaps this is largely due to the fact that, of all woods, cypress is the one which lasts best outside its native climate.

Thirty years' experience in building tanks enables us to couple this remarkable tank wood with workmanship and design that insure the maximum of tank satisfaction.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook St. Louisville, Ky.

Caldwell TANKS AND TOWERS

(*Continued from page 66*)

air from below. When laid upon earth the modern subfloor of this composition is laid in two courses, namely; foundation and damp proofing. The foundation course consists of some four inches of screened gravel or crushed stone between two and a half and one-quarter inches in size. This is mixed with tar of a proper consistency and compacted under a roller after being spread evenly in place. In cold weather the stones are slightly warmed to secure proper adherence. The damp proof course, which surmounts the foundation course, consists of a fine sand thoroughly mixed with the proper grade of tar in the proportion of not less than fifty gallons of tar to the cubic yard of sand. This mixture is spread evenly from one and a quarter to one and a half inches thick, compacted to one inch and leveled with a straight edge. Plank is laid directly over this damp proof course and hardwood flooring transversely across the plank. Frequently the ground is sufficiently firm so that a three-inch or even a two-inch foundation course is all that is required. Sub-floors of this type are also readily laid upon concrete slabs.

Steel flooring and cast iron has also come into the factory to fill an urgent need. Abrasive materials, for example, are incorporated at the time of casting into iron plates, so that the grit projects slightly above the metal; "the bite" thus secured makes slipping impossible. Such surfaces are extremely useful for stair treads, fire door saddles, elevator thresholds or hazardous places where slipping may produce serious injury.

Then there are rolled steel plates with anti-slipping qualities built into them by the raising of the diamond pattern in their surfaces or with the incorporation of a lead filling charged with carborundum. The use of such treads naturally depends upon the character of the factory equipment. Where floors are oily around machinery, such treads should be installed, as oil does not affect their non-slipping qualities.

Steel flooring is largely used for mezzanines and overhead galleries but must nevertheless be considered as coming under the head of factory floors. The modern paper mill or chemical or process plant finds considerable application for this light, clean and readily installed platform material which performs its function without shutting off the light or casting dense shadows on objects below.

A large volume could easily be written without exhausting the subject of modern factory floors. Unfortunately there is actually very little that has been printed on this subject. Let us hope that this brief resumé of modern developments will stimulate an adequate interest in this important source of manufacturing profits.

REG. U.S. PAT. OFF. TRADE JENKINS MARK Jenkins Bros

STRENGTH—found in Jenkins Gate Valves

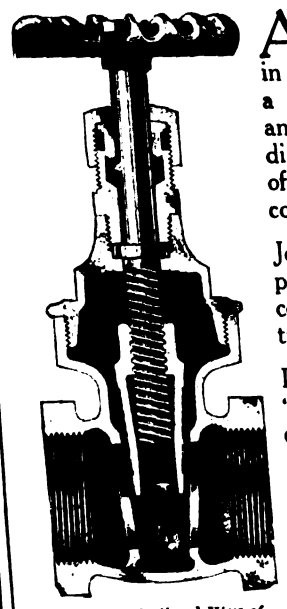


Fig. 370, Sectional View of Jenkins Standard Brass Gate Valve.

ACTUAL service has proved the Jenkins globe shaped body the best in gate valve design. This shape permits a thorough, even distribution of metal and insures valves that resist, without distortion and leakage, the severe stresses of working pressure and expansion and contraction of piping.

Jenkins design provides for use of fewer parts, each of which is strong, and heavily constructed. Standardization of manufacture insures interchangeability of parts.

Identify the genuine by the Jenkins "Diamond" and signature. Supply houses everywhere.

JENKINS BROS.

New York Boston Philadelphia
Montreal London Chicago
FACTORIES: Bridgeport, Conn.; Montreal, Can.; Montreal, Can.

Jenkins Valves SINCE 1864

Fitting the Small Steam Turbine into the Factory

(*Continued from page 11*)

not influenced by the change of season.

The boiler plants necessary to do this heating are determined, in many instances, not by the amount of power, but by the volume of heat. In such cases the quantity of coal burned will be just as much, regardless of where the power comes from.

In magnitude the heat to be provided, in numerous cases, is so much greater than the power that the latter can be generated purely as a by-product of the heating, and eighty percent of the heat from the steam passing through the power engine will enter the heating system with just as good results as the same amount of steam direct from the boilers.

The belief has become general that boilers at low pressure take very much less coal than high pressure boilers would. By high pressure, we mean from 150 pounds up, and by low pressure, boilers built for not more than 25 pounds working pressure.

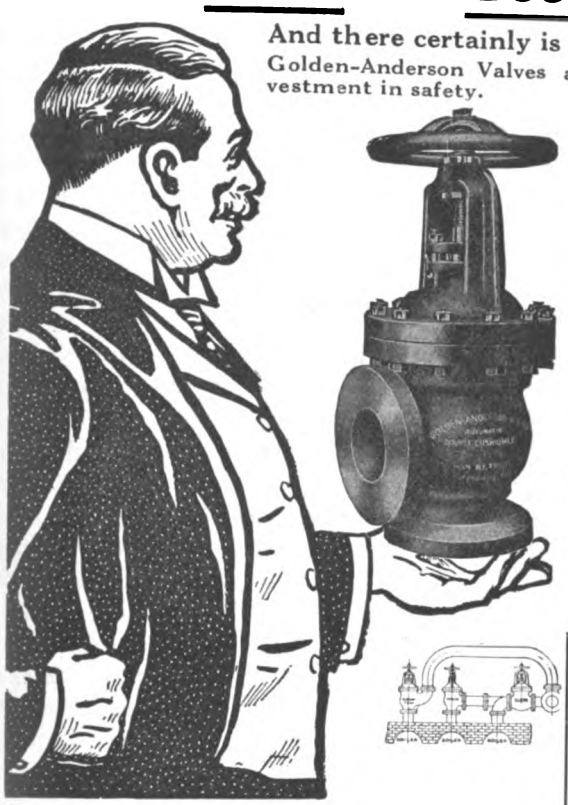
Steam pressures are believed

(*Continued on page 70*)

Digitized by Google

Why did the large Steel Corps. Install 4100 GOLDEN ANDERSON Life and Property Insurance Valves?

"There Must Be a Good Reason"



And there certainly is

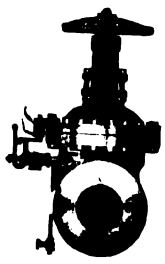
Golden-Anderson Valves are a Gilt-edged Investment in safety.

These Double Cushioned Automatic Combination Triple Acting and Non-Return Valves are the only valves that can be tested from the boiler room floor without interrupting the operation of the plant.

DOUBLE EXTRA HEAVY VALVES

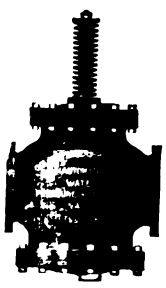
"Every Valve sold with a Positive Guarantee."

1. They will cut off a boiler instantly when one of tubes bursts.
2. They will prevent live steam from entering a cold boiler, thus insuring safety to workmen.
3. They instantly shut off the steam from all boilers when a pipe breaks.
4. They can be opened or closed by hand in the same manner as ordinary gate or globe valves when fitted with the patented safety latch.
5. Double cushioning prevents absolutely all pounding or chattering.
6. Automatically equalize the pressure between all boilers.
7. Are equipped with double Corliss Dash Pot that cushions it opening and closing.
8. Cannot pound, spin, stick or chatter.
9. Every valve sold with a positive guarantee
10. Safeguard the men and safeguard the property.



GOLDEN-ANDERSON PAT. CUSHIONED COMBINED THROTTLE AND AUTOMATIC ENGINE STOP VALVES

Gives perfect automatic control of steam or air flow in any pipe line from one or more distant points.
Can be opened or closed instantly in emergency by steam or electricity. May be tested while in service giving complete assurance of safety.
Sizes to 30"



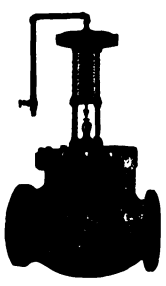
GOLDEN-ANDERSON Automatic Cushioned Water Pressure Regulating Valves

Will establish positively steady reduced water pressure. Easily adjusted from the outside. Fitted with patented safety piston to remove danger of high pressure from reaching low pressure side. Cushioned by water and air. No shock in seating.
Sizes to 30"



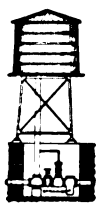
GOLDEN-ANDERSON PATENT AUTOMATIC DOUBLE CUSHION CHECK VALVE

Especially adapted for Hydraulic Elevator Service and on discharge side of pumps.
Sizes to 30"

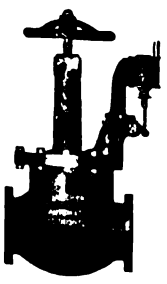


GOLDEN-ANDERSON PATENT AUTOMATIC CONTROLLING ALTITUDE VALVES

Automatically maintains uniform water level in tank, standpipe or reservoir.
No floats or fixtures.



For Fire Service

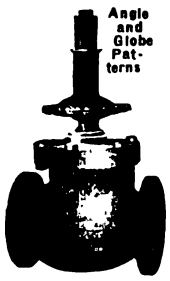


GOLDEN-ANDERSON Cushioned Electric Water Service Valves

No waste of current, as it is only on solenoid a few seconds on either opening or closing of valve. May be closed and opened from remote points electrically; also hand operated.
Air and water cushioned. No metal-to-metal seats. Virtually indestructible.
Sizes to 30"

GOLDEN-ANDERSON CUSHIONED WATER RELIEF VALVES Automatically Relieve Excess Pressure—Prevent Stress, Strain and Bursting Mains

Essentials of a durable economic and reliable relief valve are first-class material and workmanship, correct mechanical construction and operation, with no metal-to-metal seats and perfect air and water cushioning to avoid shock or hammer on the various pressures, all of Golden-Anderson Patent Automatic Cushioned Water Relief Valve.
Sizes to 30"

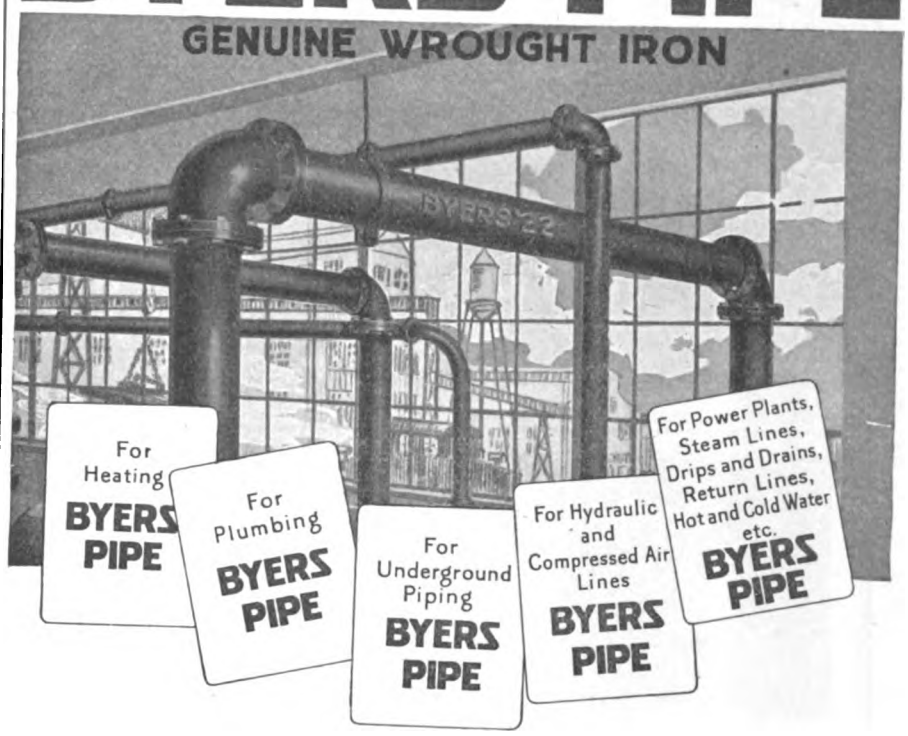


Angle and Globe Patterns

Golden-Anderson Valve Specialty Co.

1306 Fulton Building — Pittsburgh, Pa.

BYERS PIPE

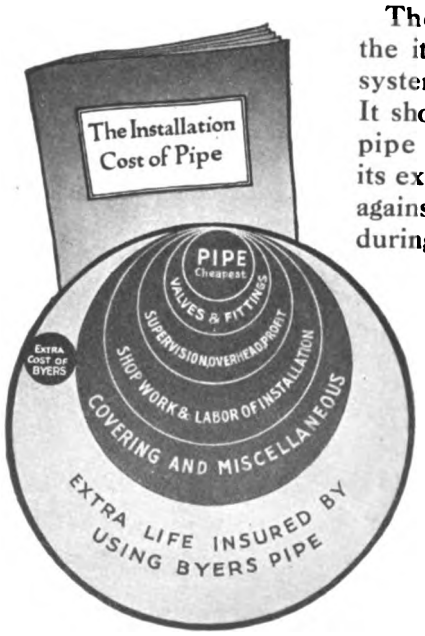


The Happy Medium

—*for every Service*

IN point of price, Byers is neither the highest nor the lowest priced pipe you can use. You can pay considerably more, often without gaining anything, for the durability of Byers pipe is such that in all but the most exceptional cases, it will last as long as the useful life of the system in which it is installed.

The useful life of the system is the important thing to consider. If you pay more to get pipe which will last much longer, your investment is obviously not a profitable one. If you pay less, and get pipe which will need replacement, your loss is considerable because the pipe cost is only a small and incidental part of the total replacement expense.



The diagram below, representing the items of cost in the average pipe system, illustrates the point forcibly. It shows why the extra cost of Byers pipe is insignificant compared with its extra life in service, which insures against heavy replacement expense during the useful life of the system.

Send for Byers Bulletin No. 38 "The Installation Cost of Pipe," containing analyses of main items of cost in a variety of piping installations, also notes on corrosive conditions in each.

A. M. BYERS COMPANY, PITTSBURGH, PA.

Established 1864

New York Philadelphia Boston Chicago Cleveland Houston

Look for the Name and Year rolled in every length

Digitized by Google

MATERIAL



ELECTRIC TRACTORS

Transport Tons

where hand trucks move pounds. They reduce expense in all your departments.

Request Catalog 1208.

The Elwell-Parker Electric Company

Cleveland, Ohio



MOTORBLOC

The Motor Driven Chain Hoist

The MOTORBLOC is hung up like any chain hoist. When connected to the nearest circuit, it is ready for work without any Engineering Preliminaries.

Light—Portable—Steel-Strong

"Hook Up, Plug In, Let's Go." Write for full details

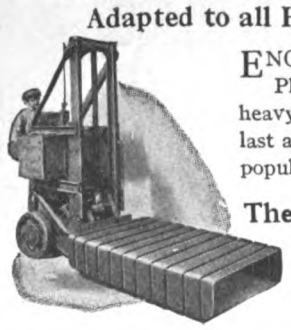


MOTORBLOC CORPORATION

Summerdale PHILADELPHIA

POWELL Pressed Steel Platforms

Adapted to all Hand and Electric Lift Trucks



ENORMOUS lifting strength is embodied in *Powell* Platforms. Made of a single piece of cold pressed, heavy gauge steel. Jointless and unbreakable, they last a lifetime. Their low cost has made them most popular. *Write for illustrated literature.*

The Powell Pressed Steel Co.

Hubbard, Ohio

Suburb of Youngstown

Unrivalled Utility a Result of Unmatched Mobility—

You may buy the Northwest with the idea of using it for routine handling work—but you'll be surprised at the number of odd jobs it will do in spare time. Handles coal, ash, stone, sand, gravel with 1 yd. clamshell bucket on 40 foot boom; timbers, logs, stone slabs, pipe, building forms with grappling hooks; steel and iron scrap with powerful electric magnet; acts as dragline or as pile driver.

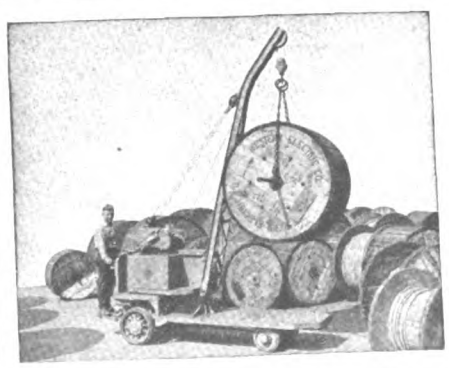
Northwest crawler base with truck-like steering device is controlled by one man; unequalled mobility; will mount pile and double-deck. Ask for specifications.

Northwest Engineering Co., Chicago, Ill.



Ask about the Northwest Gas or Electric Shovel—the shovel with only one motor.

NORTHWEST CRAWLER CRANE



Easiest Way to Handle 3,000 Pound Pieces

is on Electric Industrial Trucks equipped with REVOLVING CRANES.

Bulletin 51 tells how.

The Elwell-Parker Electric Company

Cleveland Ohio

HANDLING

(*Continued from page 68*)

to have a direct and important bearing on steam costs, but in fact, have little influence on them. The fundamental laws of steam manufacture are such that steam pressure has little effect on the amount of coal required to produce it. For example, steam at the pressure of our air, contains, in round figures, 1151 heat units per pound of avoirdupois. Steam at 172 pounds pressure contains about 1197 heat units in the same kind of a pound.

From these *facts* it will be seen that by increasing steam pressure several hundred percent, the heat content is increased an insignificant amount. In simple language, 16 ounces of steam at 172 pounds pressure has only four per cent more heat than the same quantity of steam contains at atmospheric pressure. Practically it would take no more coal to produce the same quantity of steam at 172 pounds pressure or higher than it would at 5 pounds pressure, as coal records in the best power plants seldom check within 5 or 6 per cent.

This is the fundamental reason why all large power plants are designed and built for high steam pressure; as by adding an insignificant amount of heat, the steam can be increased in pressure many fold and thereby add to its capacity for doing mechanical work.

On account of these facts, it is little short of an economic crime to blow steam into a multitude of heating systems at low pressure, without first taking therefrom the mechanical work that this steam would be capable of performing, if it were raised to a reasonable working pressure, and with no appreciable increase in the amount of fuel required to do so."

It is in this new conception of the heat equation of the plant as a whole that the small steam turbine is coming to be recognized more and more as a powerful factor in cutting the cost of the coal pile. For these compact and easily operated units are unrivalled in helping the engineer to most profitably compensate his heat equation for variations in power requirements, in exhaust steam requirements and in hot water requirements. Sometimes this is done by the installation of "bleeder" or extraction turbines, sometimes with back pressure turbines which utilize the heat fall between the engine exhaust and the condensate temperature, turning it into usable power. Valve arrangements may be provided with modern turbines that act automatically in varying the turbine action and the conditions of entering and exhaust steam so as to make an automatic controlling unit of the turbine whose purpose is to act as compensator in the plant heat equation. Thus, one of our illustrations shows a turbine which by means of such valves, automatic in their action, operates at different times as, first a high pressure condensing turbine; second, back pressure turbine; third, extraction turbine; fourth, mixed flow turbine; fifth, low pressure turbine. These rather complicated actions are carried out by means of three simple valves. Two of these valves are controlled by the speed governor, one admitting live steam to the high pressure and of the turbine, and the other admitting low pressure steam to the low pressure end. The governor levers are so arranged that the valve in the low pressure connection always opens before and closes after the high pressure valve, so that the turbine will utilize any surplus low pressure steam before it will draw upon the high pressure steam. The third valve is also in the connection to the low pressure end, and is controlled by the pressure in the low pressure piping. When the pressure in the latter rises, that is when there is a surplus of exhaust steam from other sources, this valve opens, but when the pressure in the low pressure piping is low, as it is when more steam is needed for heating water, etc., this valve closes.

Steam turbines in industrial plants offer large possibilities in the way of economizing fuel. the various "hook ups" which can be employed with them should be more widely known. One interesting example is the use of a steam turbine in connection with the operation of a large paper machine. Here the exhaust of the turbine is used for heating the rolls. It was found that the current required to drive the paper machine did not load the turbines

Digitized by Google

sufficiently to produce enough exhaust steam for heating the rolls. In this case an alternator which was coupled to the same shaft, served to load the turbine to the point where sufficient exhaust steam was secured and also furnished alternating current to the general power circuit of the mill.

It is becoming quite common now to provide duplex drives for auxiliaries in condensing power plants in order to be able to regulate the amount of exhaust steam according to the feed water heating requirements. An AC generator and a DC generator are coupled to a turbine. The DC generator is used as an exciter and the power to drive it can be supplied either by the AC generator acting as a motor or by the steam turbine. The turbine can also drive both of the electrical units as generators when the feed-heating requirements are exceptionally large, as during peak load periods, the AC power produced at such times being sent back into the main circuit and relieving by that much the demand upon the main generator.

The development of the small turbine from 1 hp. to 10 hp. and of fractional horsepower sizes has led to a great many efficient uses for these units coupled to a number of varieties of driven apparatus. Prominent among these are forced draft fans or blowers which may be inserted directly in the ash pit wall of a boiler and not only enable cheaper grades of fuel to be burned but respond very quickly to heavy demand or overloads. Oftentimes these are automatically controlled by pressure governors so that a consequent steam pressure may be maintained in the boiler regardless of load requirements.

The development of the reduction gear has had a large place in widening the field of the modern turbine. Aside from the small power units the reader will notice that practically every installation shown in this article comprises a reduction gear. Before the perfection of suitable speed reducing apparatus it was generally necessary to compromise between suitable speeds for the turbines and the driven apparatus, at a sacrifice in efficiency of both. Now it is possible to maintain the high turbine speeds which mean both compactness and economy and to select exactly that speed which is best suited for the driven apparatus, by means of a gear reduction.

With all of these improvements the modern steam turbine fits effectively into the heat equation of the modern factory.

Food Distribution as an Industry

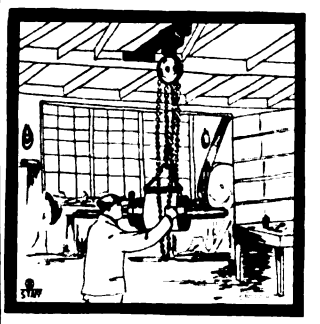
(*Continued from page 13*)

purchase all goods in carload lots, whenever possible, and have them shipped direct to their warehouse sidings. The unloading of these cars had to be done quickly and it was often necessary to draw labor from the main warehouse floor to assist in getting the cars unloaded.

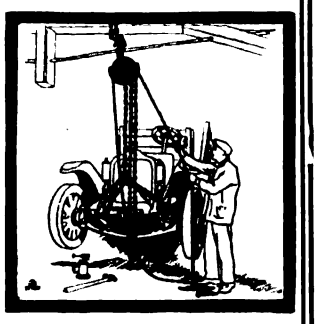
The old method required from 2 to 3 men per car or approximately 8½ man hours to unload a car of 1000 cases. These men used to pick the goods up within the car, carry them to the car door, and place them on platform skids. When a skid was loaded the electric truck would take it to the store-room. These men are paid 42 cents per hour, which places a cost of $3.57 against 1000 cases for unloading, or a charge of $0.0035 cents per case.

The second picture on page 12 shows the present method of unloading cars by means of gravity conveyors. This conveyor eliminates the labor of carrying the goods from the end of the car to the door and thus speeds up the work, so that now 1000 cases are unloaded in 6 man-hours. This saving of 2½ man hours reduces the cost to $2.25 per 1000 cases, or a charge of $0.0025 cents per case. Since these men unload on the average of 4000 cases per day the use of conveyors is saving

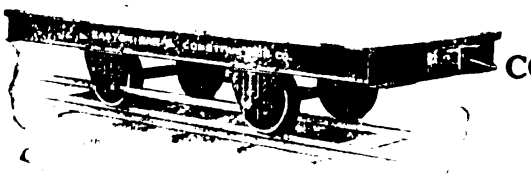
MATERIAL



Chain Hoists
FOR
All Purposes
¼ to 50 Tons Capacity
Safe Dependable Economical
Our catalog will interest you
WRIGHT
Lisbon, Ohio

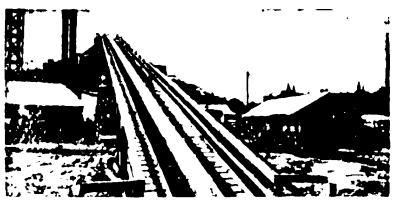


EASTON CARS



COMPLETE INDUSTRIAL RAILWAY EQUIPMENT

EASTON CAR AND CONSTRUCTION CO.
Main Office & Works: Easton, Pa. Branches in Principal Cities



Robins Conveying Systems
complete with all accessories, for the rapid and economical handling of bulk and package materials.

Write for Handbook of Conveyor Practice

ROBINS CONVEYING BELT COMPANY
New York Chicago Pittsburgh Boston

"*Handling*" is the wrong word



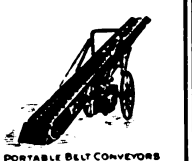
when applied to Dow Conveyors. *Handling* suggests *carrying by hand* whereas the very purpose of Dow Conveyors is to dispense with costly human effort in moving parts and finished products from one place to another. Dow Conveyors (Gravity and Power) do away with porters and enable the skilled mechanic to devote *all* of his time to production instead of intermittently walking the floor. Many manufacturers are not aware of the time-labor-and money-saving ability of Dow Conveyors. The facts are yours for the asking. The Dow Co., Incorporated, Louisville, Ky.



DOW CONVEYORS

MATERIALS HANDLING EQUIPMENT THAT CUTS COST TO BEDROCK

HAISS



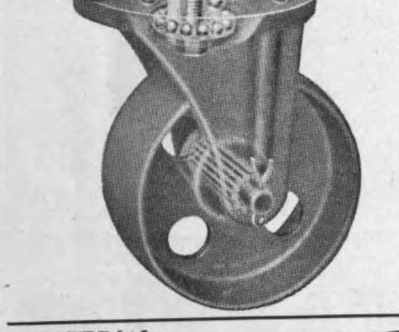


Portable Belt Conveyors—Truck Loaders
Catalog on Request
THE GEO. HAISS MANUFACTURING CO., Inc.
146th St. & Canal Place, New York

HANDLING

Digitized by Google

MATERIAL



AMERICAN INDUSTRIAL
Frictionless
DOUBLE BALL and ROLLER BEARING CASTERS

The American Caster swivels on balls, rides on balls and rolls on rollers.

ABSOLUTELY WILL NOT drag sidewise. Rigid casters to match.

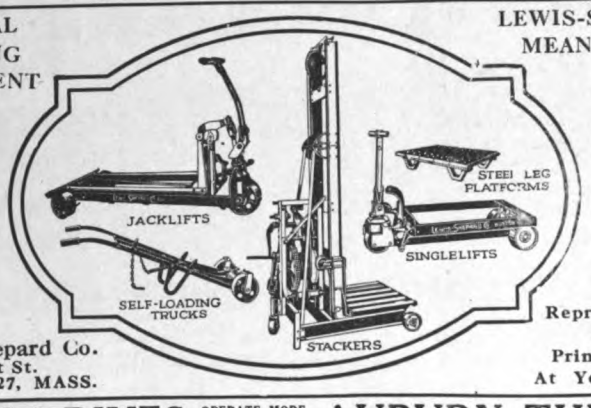
If you are not getting satisfactory service from the casters you use on your industrial trucks or product,

Try the AMERICAN.

PHILIP A. HELLER & SONS
213 West State Street
Detroit, Mich.

MATERIAL HANDLING EQUIPMENT

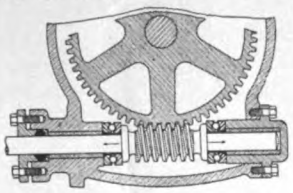
LEWIS-SHEPARD MEANS LABOR SAVING

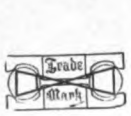


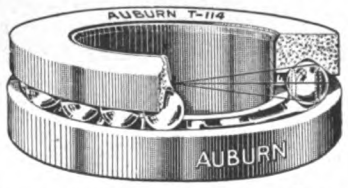
Made by
Lewis-Shepard Co.
582 E. First St.
BOSTON 27, MASS.

Representatives in the Principal Cities At Your Service

WORM DRIVES OPERATE MORE SMOOTHLY WITH **AUBURN THRUSTS**







Reduce back lash, increase the life of bot Worm and Gear, and get smoother operation by using AUBURN BALL THRUST BEARINGS. Tell us your problem and get the Auburn Answer. Ask for Catalogue.

STEEL BRASS AND BRONZE BALLS

AUBURN BALL BEARING COMPANY

20 INDUSTRIAL STREET ROCHESTER, N. Y., U. S. A.

The rate for space in this section is $20.00 per advertisement.

Your announcement in this column will absolutely pay you in big dividends and will secure from INDUSTRY ILLUSTRATED'S 20,000 executive readers attention far out of proportion to its cost.

Copy for the March issue can be received up to February 10th.

SEND IT IN IMMEDIATELY.

Advertising Department
INDUSTRY ILLUSTRATED
120 West 32nd Street
New York

HANDLING

$4.08 per day on car unloading alone. These conveyors are portable and can be used on other operations within the warehouse, where they are also effecting additional savings of time and money.

If the old hand method of unloading cars by means of common hand trucks were attempted the plant superintendent believes that first of all the cost per case would be at least three times as much as the present method, and second, it would be impossible to handle the goods.

Another point where a comparison can be made between old and new methods is on the operation of piling goods in the surplus stock storeroom. The old practice used to be that of bringing a loaded skid from the cars and placing it on the floor. The second loaded skid was placed beside it and two men piled the cases from the second skid on top of those carried on the first skid. This meant another rehandling when the cases were taken out of surplus stock and placed on the picking floor. Thus the two additional handlings added $0.005 cents per case or $5.00 per 1000 cases for those which of necessity had to be placed in surplus stock and piled.

By using a tiering truck and piling the loaded skids, one on top of the other as shown in the lower left hand corner of page 12, this additional expense was eliminated and the work done without delay. When the tiering truck is not being used to pile loaded skids it operates the same as a lift truck and transports materials about the warehouse.

After the orders from the different stores have been properly received at the main office and the necessary billing has been placed against the various store accounts, they are sent direct to the warehouse picking floor. The upper right hand corner of page 13 shows a general view down the main aisle of this floor. Here the order pickers remove the different items from stock skids and place them on trailers. Each trailer carries a separate order and in no case is more than one order placed on a trailer; but quite often the orders are so large that it requires two or three trailers for one order.

There is another point to be considered. One picker does not pick the entire order; the with completed orders. The order blanks being made up in such a manner that it is easy to detach for each section of the warehouse and each order picker works only within a particular section. This is quite an important point and one that makes it possible for the order pickers to do their work quickly and efficiently. When the order picker notices that a certain commodity is running low he arranges with the operator of the electric lift truck to bring a new loaded skid from the surplus stock room. In this way only the really necessary stock is carried on the order picking floor.

In this warehouse is embodied a feature that is often overlooked: namely the entire warehouse is on one floor level and is known as a single floor warehouse. This form of layout eliminates the delays of waiting for elevators to carry goods between floors. Previous to acquiring this new plant the Bohack Company operated a three-story warehouse, and the older men who have worked in the old building and the new building assert that it would be impossible to accomplish as much with the old layout as they now accomplish with the new layout.

After the orders are placed on the trailers, the trailers are placed in the main aisles and the order picker starts on the next order.

At this time the electric tractor comes into operation, and it is the tractor driver's duty to keep the aisles clear of all trailers that are loaded with completed orders. The view in upper center of page 13 shows the tractor pulling a train of trailers from one section of the order-picking floor, to the shipping bays on the truck loading platform. Looking closely, it will be seen that each trailer load appears to be identical. This is because the loads are all coming from one location in the warehouse. When this train of trailers arrives at the shipping bays it is placed in the forward space shown at the right, where it is checked and then moved by hand into the further bays, where the entire order is consolidated and again checked. It

Digitized by Google

has been found that frequent checking pays, as it reduces mistakes and expense of returning to the warehouse goods that were not ordered by the store manager.

The same attention is paid to the loading of trucks as has been carried out through the different steps of unloading from the cars, placing the goods in stock, etc. When the trailers are moved to the further bays on the truck loading platform, they are placed in such a manner that the goods to be removed from the truck at the first stop are placed on the truck last. Having the goods on trailers at this point, instead of on skids, allows the truck loaders to push the loaded trailers directly into the truck, thus eliminating the necessity of carrying each item from the tail board to the front end of the truck body.

To give an idea of the speed of loading these auto trucks and a further idea of how many tons of goods are handled per day in this plant and also to show the economy that can be maintained by the use of material handling equipment, the writer will include a portion of the study made by him on the truck loading at this modern food distributing plant.

Each truck is loaded one to three times per day, depending upon the length of haul and the territory served. It is not unusual for from ten to fifteen trucks to arrive for the second loading within twenty minutes. This requires a speedy crew to load these trucks, so that no time may be wasted in waiting between loads. With the arrangement of all orders on trailers and the consolidation of these orders, 6 men have loaded 13 trucks in 1¼ hours time—loading 3,090 pieces of merchandise or approximately 69 tons of materials to be delivered to 37 stores. This is a remarkable feat, but not unusual at this plant, although the writer has never seen it duplicated at any other.

At the present time the grocery warehouse department is operated with a force of 29 men, 11 of whom are order pickers, 14 are car unloaders and truck loaders, and 4 are used to operate 2 electric lift platform trucks, 1 tiering truck and 1 tractor. When we consider that each order picker picks about 550 items in an 8-hour day, it means that on the average 6000 pieces of merchandise are taken out of stock each day and 7000 pieces are placed in stock. This total of 13000 pieces to be handled each day is the best indication that this modern food distribution plant is run efficiently.

The meat department is separate from the grocery department, is operated independently, and has its own labor force. The work in the meat department is not so complicated and is all handled by means of overhead carriers, plain, and rack trucks. The center view, page 13 shows the truck loading and unloading platform of the meat department and the picture in the lower right hand corner shows an interior view within the cold storage-room. The meat department has a complete turn-over of stock at least four times a week.

The company has paid considerable attention to the interior of their distributing plant but they have not in any way neglected the main artery that ties the warehouse in with the stores: namely, their delivery trucks. These trucks are of various makes, as the company is trying to see which make will be adopted as standard, and of various capacities, from 2 to 7½ tons. These cars are given the best of care and all repair work done in the company's own repair shop. This shop is well equipped and the company has found it pays to maintain their own repair department. The work is so well taken care of at the slightest sign of trouble that it is seldom found necessary to keep a truck out of service for more than a day or two; but the company maintains extra trucks in the garage for emergency, for they realize that it is important to deliver the goods when they are called for and without delay. The view at the bottom of page 13 shows the interior of the garage.

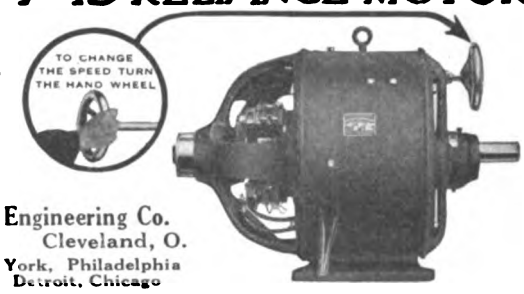
The entire problem of food distribution is really a matter of handling materials from one place to another. If this work is not properly done the consumer, the public, must bear the expense. This is also true in the manufacturing of goods at the producers' plants.

POWER

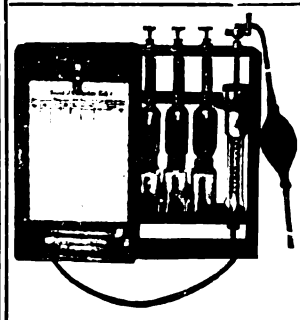
THESE motors will provide your machines with operating speeds to suit all kinds of jobs. They run at any speed over ranges up to 1 to 10. There is no power lost as speed is varied.

Get bulletin 1014 for details

Type A.S. Adjustable Speed RELIANCE MOTORS



Reliance Electric & Engineering Co.
1045 Ivanhoe Road Cleveland, O.
Branches: Boston New York, Philadelphia Pittsburgh, Cincinnati Detroit, Chicago

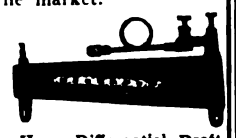


Hays Improved Gas Analyzer. Note absence of pinch clamps, rubber connections and glass cocks.

TWO INSTRUMENTS WITHOUT EQUAL

as aids in cutting fuel costs are pictured here. Each is the very best of its kind on the market.

We have for free distribution to power plant men some intensely interesting and instructive pamphlets about flue gas analysis and draft regulation. It will pay you to write for them.



Hays Differential Draft Gage. Baked black enamel finish, steel case Rugged, accurate.

The Jos. W. Hays Corporation
Combustion Efficiency Appliances
Michigan City, Indiana



MOUNTED FOR BOILER

"CALOREX" Burners
Using STEAM or AIR for Atomizing

33 years experience manufacturing liquid fuel equipment. Cheapest to operate—Simple in construction. *No parts to wear out*—Will last a life time. Burns FUEL OIL, CRUDE OIL or TAR. Write for catalog

W. N. BEST FURNACE & BURNER COMPANY
11 Broadway ENGINEERS IN CALORIC NEW YORK

—a big subject
—a book that covers it thoroughly



THE scenes shift almost overnight: Yesterday furnace building was forgotten in the clamor for greater combustion rates; today hundreds of plants are realizing that combustion rates have found their limit in the staying power of refractories that once were considered "good enough."

How to build a furnace that will stand the gaff of modern firing methods is the subject of the hour:

—And it is the subject of this new book—just off the press. Its fifty pages are devoted to every angle of the furnace problem; why furnaces fail; how to build furnaces that will not fail.

50 pages of furnace facts—
FREE

The book is free. Write for it, to—
JOINTLESS FIRE BRICK CO., 1154 Clay Street, Chicago

Now is the Time to Save Coal

Makers of coal economizing instruments can use this column as their silent salesman at the small cost of $20. a month, reaching 20,000 industrial executives who are always on the lookout for equipment that means economy. Send in your copy for the March issue, or have us prepare something for you. Write

Advertising Department
INDUSTRY ILLUSTRATED
120 West 32nd St., New York

EQUIPMENT

Digitized by Google

HUNT CONVEYOR

Twenty Years Ago

C. W Hunt of West Brighton, was granted a patent, twenty years ago, for a new conveyor.

The

This clipping from a local New York paper of January 3, 1923, recalls an achievement that marked another step toward perfection in the rapid, safe and economical handling of bulk material—which was the ambition of the founders of this business back in 1872.

The proof of this is emphasized by the great number of HUNT CONVEYORS installed in plants of every character; handling Coal, ashes, Phosphate Rock, Cement Clinker and other bulk material.

Catalogue G-20-2 fully describes the machine and its many improvements, and contains detailed information helpful in adapting it to new or old Power Plants, Cement Mills, Coaling Stations, etc., etc.

A copy gladly sent to those interested.

C. W. HUNT CO., Inc.

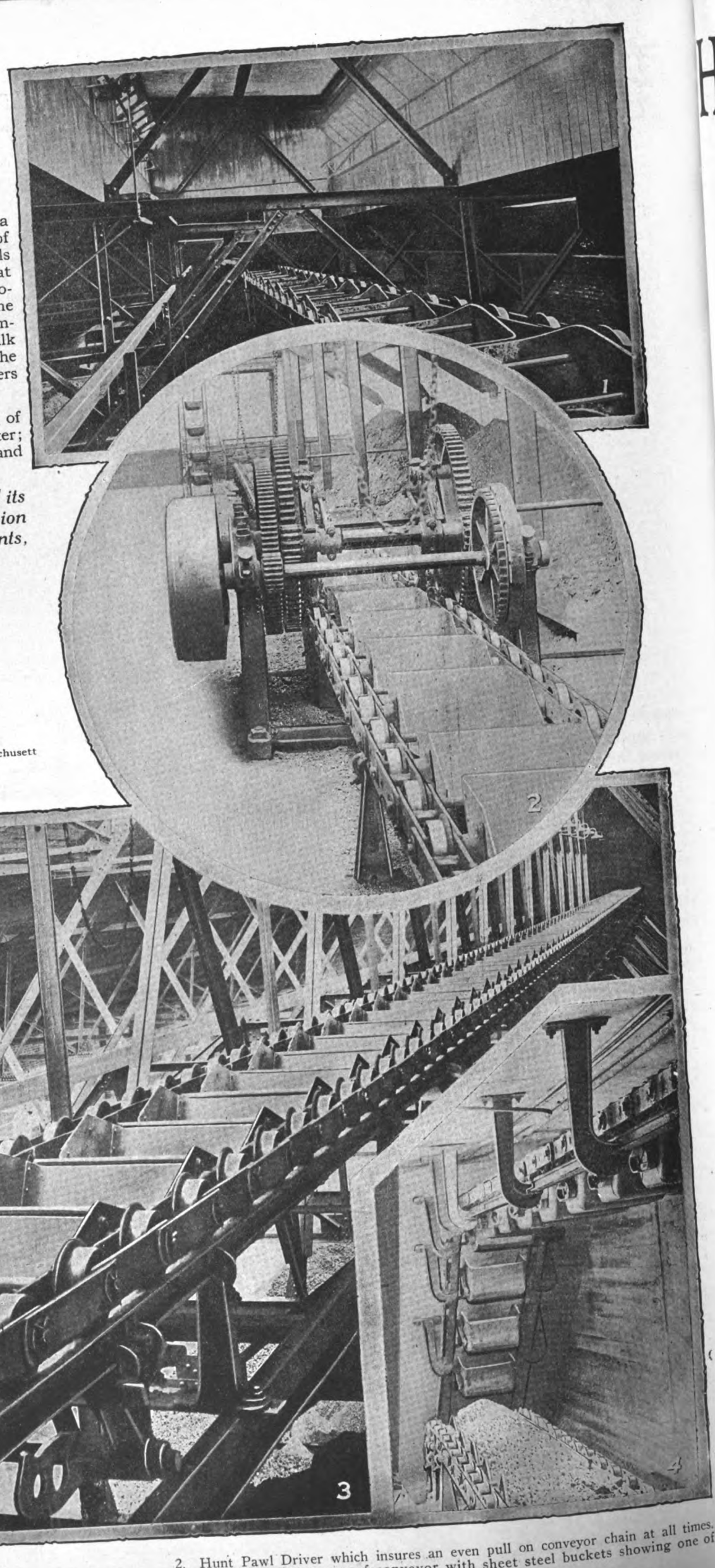
Main Office and Works

WEST NEW BRIGHTON, NEW YORK

New York Office, 143 Liberty Street

Phillips, Lang & Co., Inc.
538 South Dearborn St.
Chicago, Illinois

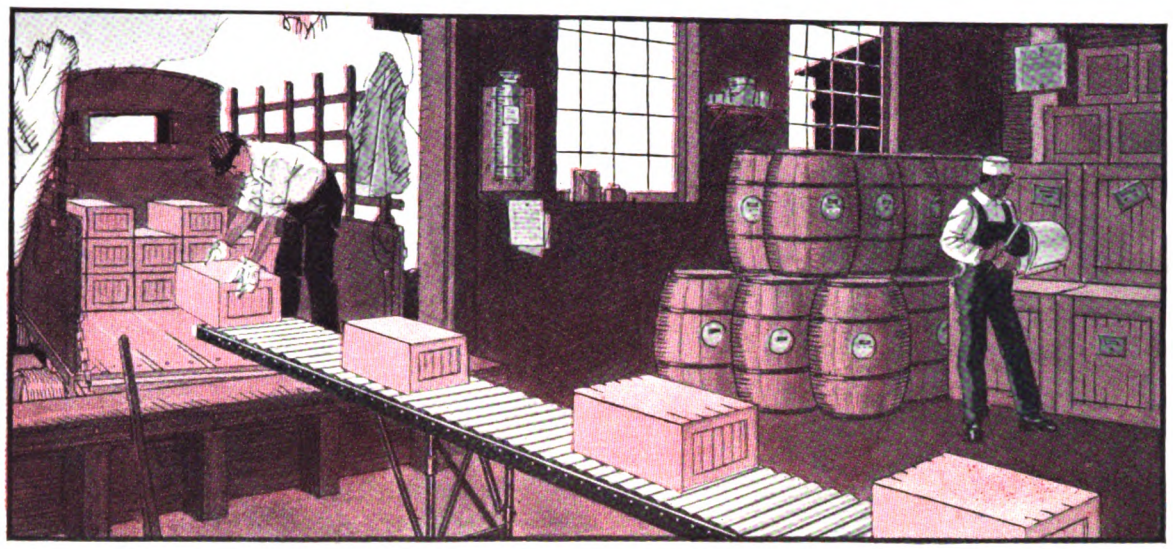
Ernest F. Learned,
141 Milk Street
Boston 9, Massachusett



1. Pivoted bucket conveyor with cast iron buckets.
2. Hunt Pawl Driver which insures an even pull on conveyor chain at all times.
3. Conveyor with sheet steel buckets for handling coal installed in large Pumping Station.
4. Upper and lower run of conveyor with sheet steel buckets showing one of the many methods of supporting conveyor.

Digitized by Google

Hand-Less Handling



Just a few feet of conveyor
but they do the work of many hands

HOW long does it take to load cars or trucks at your shipping-room door? If the handling is done by human hands, you are delaying the outward flow of goods. If your men place boxes and packages on hand-trucks, wheel them out to cars or trucks, and there handle them again, they are wasting energy and time.

Short sections of Lamson Gravity Conveyor would cut handling and rehandling costs to a minimum. They would speed up loading, do the work in half the time, and release hand-truckers for productive work.

There is enough handling and rehandling in almost any factory, warehouse, or wholesale establishment to warrant the use of a few short sections of gravity conveyor. They are easily movable and can be set up in receiving-room, in storeroom, between manufacturing processes—in any place where conveying service is needed.

The initial cost of Lamson Short Section Conveyors is small. After installation they cost practically nothing to run, for the weight of materials or products carries them to their destination.

Where you can use short sections

Loading — Boxes can be rolled in and out of trucks in half the time it usually takes to unload and load. Labor is also cut in half.

Between Machines — Gravity conveyors keep work moving at an even pace that gives uniform production. A section like this soon more than pays for itself.

As a Work Bench — Gravity conveyors serve as a work bench along which workmen adjust and inspect products and crate them for shipping.

Packing — Gravity conveyors allow men to pack the goods and seal the boxes as they move by them in a constant stream.

Test these short sections

Perhaps hand-less handling is just what you need in *your* shipping room, or in other parts of your warehouse or plant. A few sections of Lamson Gravity Conveyor will do the work of many hands. A short trial will prove their efficiency. You can easily add to the first units later.

A Lamson engineer will gladly show you how to get the best service from our gravity conveyors. Meanwhile, if you desire further information concerning short sections of Lamson Gravity Conveyors, we will send you catalogs describing them in detail.

THE LAMSON COMPANY
SYRACUSE, NEW YORK
Branches in Principal Cities

Lamson Conveying Systems

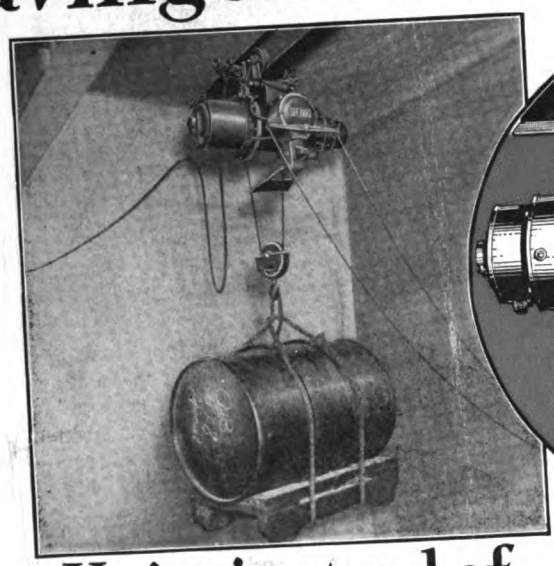
LAMSON SERVICE

Digitized by Google

THE SHEPARD ELECTRIC LIFT ABOUT

A new and smaller Electric Hoist

Savings like these for your business



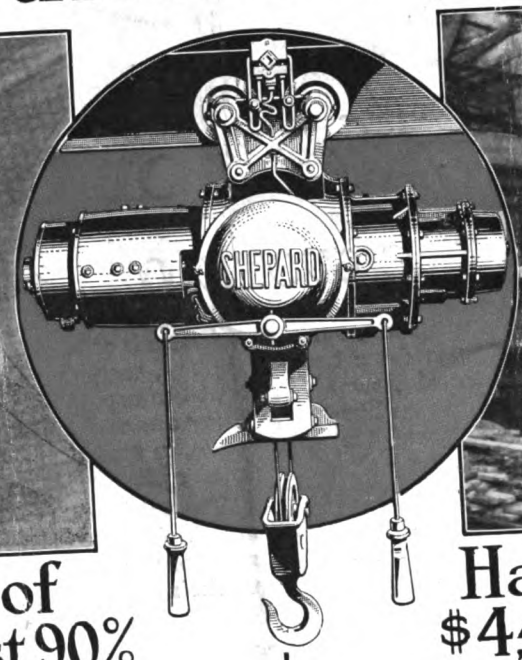
Hoist instead of elevator cuts cost 90%

J. N. Thier, Supt. of Formica Insulator Co., Cincinnati, says:

"When our 2-story factory building approached completion we faced the problem as to whether we should put in an elevator. It seemed hardly necessary for a 2-story building, yet we had a great many heavy loads to carry up to the second floor. A Shepard *LiftAbout* Hoist, running on a short overhead trolley from the second floor ceiling, was finally installed for about one-tenth what an elevator would have cost.

"Our Shepard *LiftAbout* is used for lifting rolls of paper, drums of varnish, etc., to the second or manufacturing floor. Four or five rolls of paper, weighing a total of 1,200 lbs., are placed on a platform and elevated together. Drums of varnish, weighing from 1,300 to 1,400 lbs., are handled on the platform, one at a time. This arrangement is fully as quick and practical as having an elevator, and is far less expensive in first cost.

"Anybody can learn to run a Shepard *LiftAbout* in a short time. It requires no attention whatsoever, and can easily take care of any load in a plant like ours. We chose a Shepard Hoist, because our experience with other Shepard equipment has proved it well built and reliable."

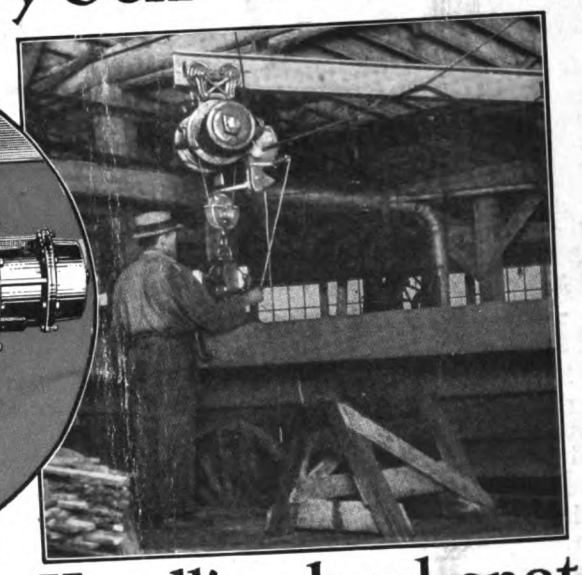


An electric hoist for everybody — remarkably low in price

It is only due to quantity production that the price of a *LiftAbout* is so low. It has the same features of design and construction that have made "Shepards" the most widely used electric hoists in America.

Start a *LiftAbout* saving in your business NOW. We'll gladly tell you about the economies enjoyed by others in your line.

Write for folder showing many applications



Handling lumber at $4,400 yearly saving

William H. Taplin, Supt. of the Edward Hines Lumber Co., Chicago, says:

"Handling lumber is not an easy task—its size makes it awkward to handle and its weight usually requires a number of men to lift it, and besides, considerable time is consumed. With this the situation, we are of course, always interested in equipment that will make our task easier. Therefore, when we learned of the Shepard *LiftAbout* we immediately saw in this something of big value to us.

"In our planing mill we handle timber from the wagons to the machine tables and then back to the wagons. Here's where we saw an application for the Shepard *LiftAbout*—and on June 1st we purchased two *LiftAbouts*. The timber handled runs as large as 16 by 16 inches and varies in length from 20 to 60 feet. Although these *LiftAbouts* are called one-ton hoists we have lifted as much as 3150 pounds with them—and no doubt could lift more.

"Each *LiftAbout* replaces 3 and sometimes as many as 8 men when the heavy timbers are being handled. This is about one-third of the time, so, figured conservatively, each hoist saves us one man's wages. At $.35 an hour and working a 10½-hour day, this is at the rate of $7.35 a day or $2,200 a year for the two hoists. So pleased have we been with these *LiftAbouts* that we have just purchased two more and we expect them to be as great labor savers as the first two—and so our total saving on the 4 Shepard *LiftAbouts* will run $4,400 a year.

"The *LiftAbouts* are easy to operate—after running them a short time a man becomes very expert with them."

SHEPARD ELECTRIC CRANE & HOIST CO. SHEPARD ELECTRIC CRANES & HOISTS **420 Schuyler Ave., Montour Falls, N. Y.**

MARCH 1923

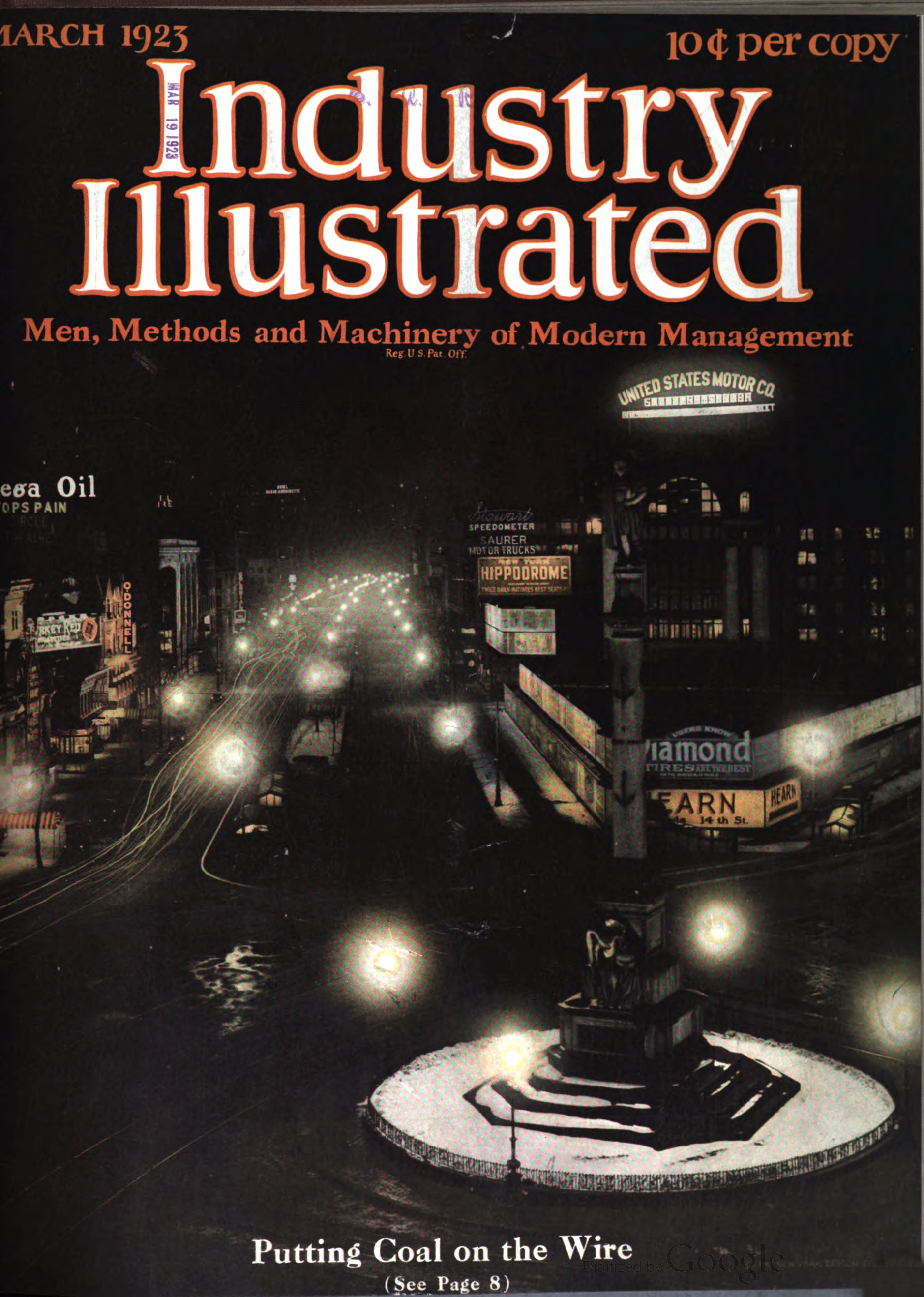
10¢ per copy

MAR 19 1923

Industry Illustrated

Men, Methods and Machinery of Modern Management

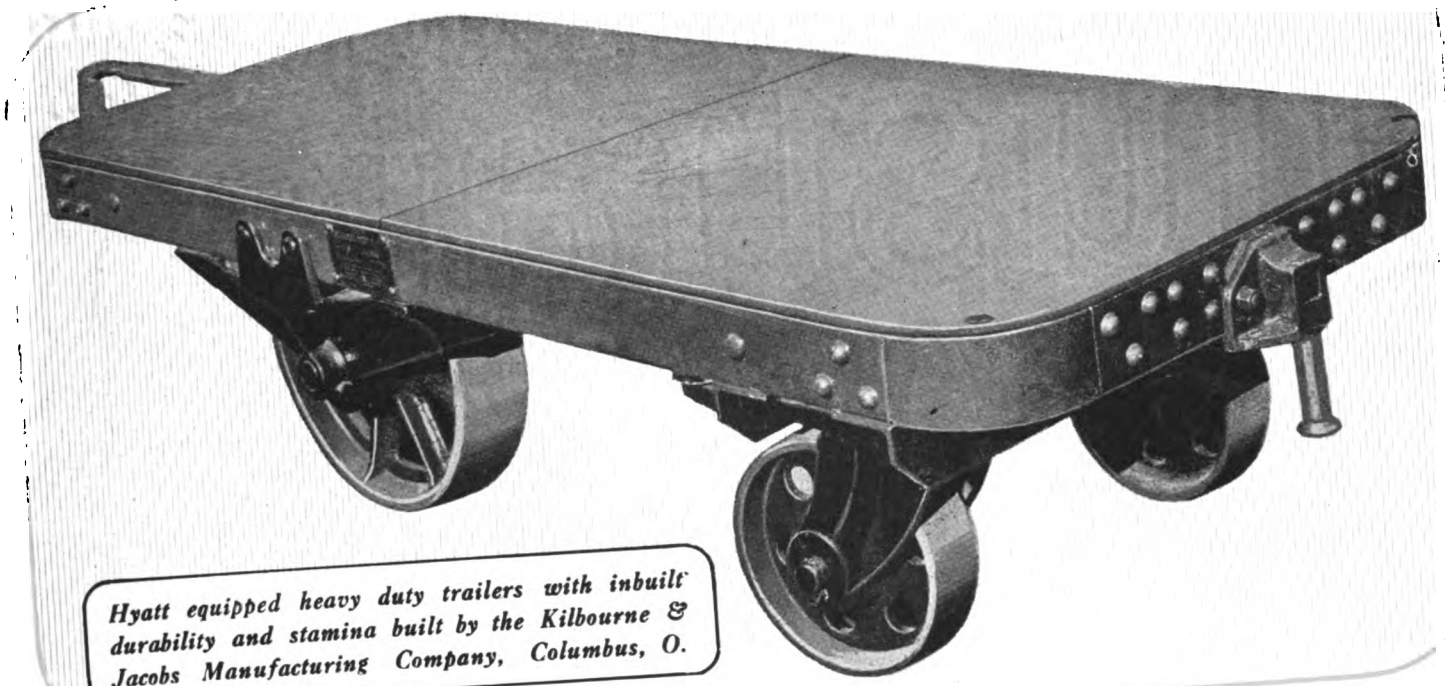
Reg. U. S. Pat. Off.



Putting Coal on the Wire

(See Page 8)

Digitized by Google



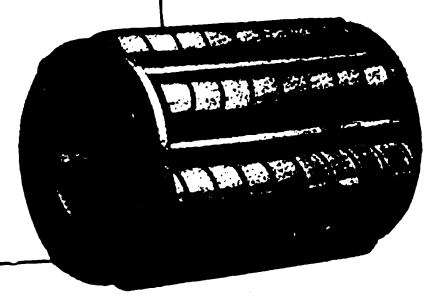
Hyatt equipped heavy duty trailers with inbuilt durability and stamina built by the Kilbourne & Jacobs Manufacturing Company, Columbus, O.

Building Durability Into Trailers

For handling large tonnages quickly and economically the tractor and trailer method is both ideal and practical. To obtain maximum service from trailers however at lowest cost—durability, the quality to successfully stand up in continuous operation, must be designed and built into the trailers.

The heavy duty trailers manufactured by Kilbourne & Jacobs are excellent examples of durably built trucks. Their strong platforms, wheels and axles are matched with sturdy Hyatt roller bearings and the combination gives a trailer that will dependably carry its loads continuously for years without bearing adjustment or replacement.

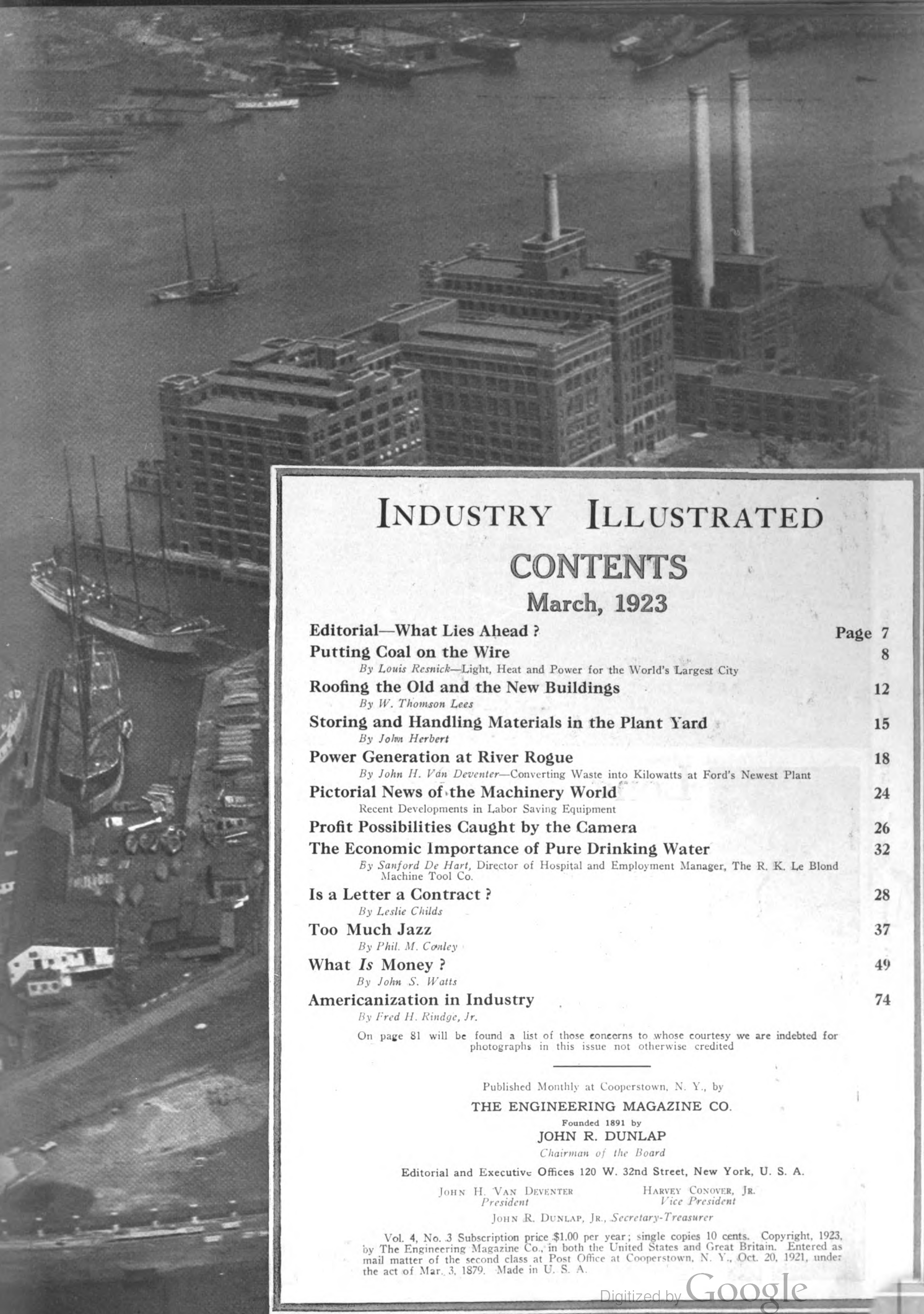
For a truly economical trucking system—specify that your trailers be Hyatt equipped.



Hyatt Roller Bearing Company

Worcester	Newark	Philadelphia	Pittsburgh
Detroit	Huntington	Cleveland	Indianapolis
Chicago	Milwaukee	St. Louis	San Francisco

Digitized by Google



INDUSTRY ILLUSTRATED

CONTENTS

March, 1923

Editorial—What Lies Ahead ? Page 7

Putting Coal on the Wire 8
By Louis Resnick—Light, Heat and Power for the World's Largest City

Roofing the Old and the New Buildings 12
By W. Thomson Lees

Storing and Handling Materials in the Plant Yard 15
By John Herbert

Power Generation at River Rogue 18
By John H. Van Deventer—Converting Waste into Kilowatts at Ford's Newest Plant

Pictorial News of the Machinery World 24
Recent Developments in Labor Saving Equipment

Profit Possibilities Caught by the Camera 26

The Economic Importance of Pure Drinking Water 32
By Sanford De Hart, Director of Hospital and Employment Manager, The R. K. Le Blond Machine Tool Co.

Is a Letter a Contract ? 28
By Leslie Childs

Too Much Jazz 37
By Phil. M. Conley

What *Is* Money ? 49
By John S. Watts

Americanization in Industry 74
By Fred H. Rindge, Jr.

On page 81 will be found a list of those concerns to whose courtesy we are indebted for photographs in this issue not otherwise credited

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.

Founded 1891 by

JOHN R. DUNLAP

Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — HARVEY CONOVER, JR., *Vice President*

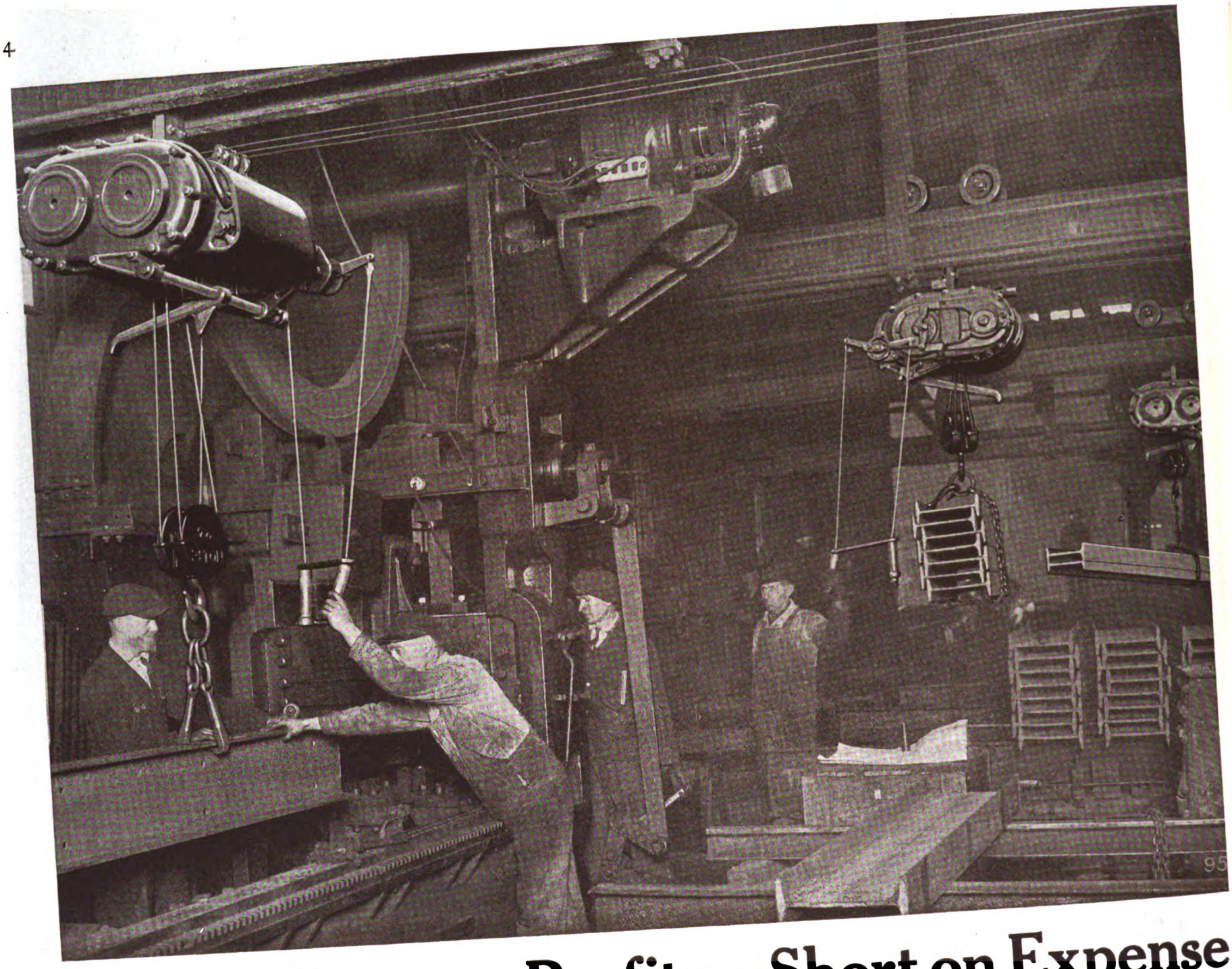
JOHN R. DUNLAP, JR., *Secretary-Treasurer*

Vol. 4, No. 3 Subscription price $1.00 per year; single copies 10 cents.

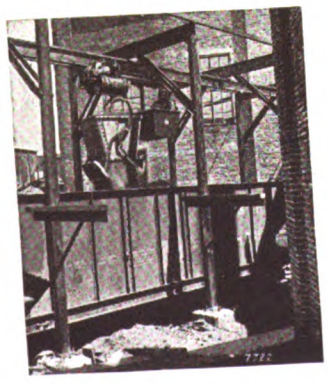
Copyright, 1923, by The Engineering Magazine Co., in both the United States and Great Britain.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google







Long on Profits—Short on Expense

IT'S NOT only because Link-Belt Electric Hoists and Cranes are built right that they are profit producers. Link-Belt engineers make certain their applications are dead right from the profit viewpoint before they are installed. They know that the installation which saves the customer money in terms of labor, speed or materials is a good argument for the next installation. This is the biggest argument for Link-Belt equipment in business today—it pays profits; dividends on its original, operating and upkeep cost.

Link-Belt Hoists and Cranes are made in any capacity to handle every material. Floor or cage operated. Low in initial cost and easy to install.

There is a money-making application for one of them in your plant. Let us point it out to you. Send for catalog.

1058

LINK-BELT COMPANY

CHICAGO

PHILADELPHIA
New York . . . Woolworth Bldg.
Boston 9 . . . 49 Federal St.
Pittsburgh . . . 1501 Park Bldg.
St. Louis . . . Central Nat'l Bank Bldg.
Buffalo . . . 547 Ellicott Square
Canadian Link-Belt Co., Ltd., Toronto and Montreal

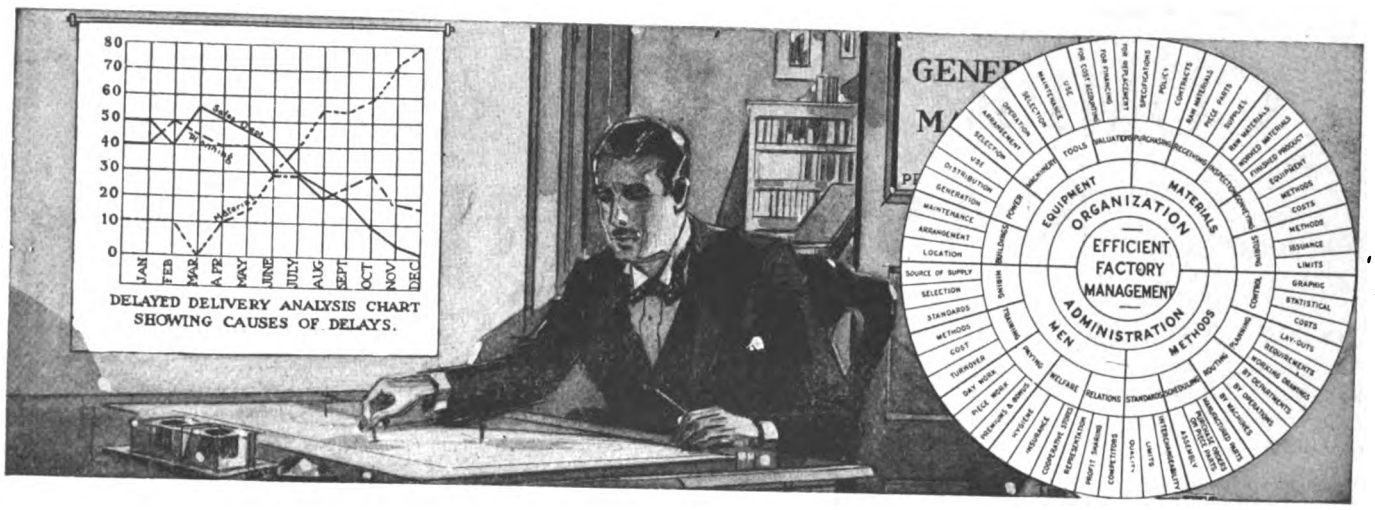
Wilkes-Barre . . . 2d Nat'l Bank Bldg.
Huntington, W. Va. . . . Robeson-Prichard Bldg.
Cleveland . . . 429 Kirby Bldg.
Detroit . . . 4210 Woodward Ave.
Kansas City, Mo . . . 306 Elmhurst Bldg
H.W. CALDWELL & SON CO., CHICAGO

Seattle . . . 820 First Ave., S.
Portland, Ore. . . . 101 First St.
San Francisco . . . 168 Second St.
Los Angeles . . . 163 N. Los Angeles St.
Denver, Lindrooth, Shubart & Co., Boston Bldg.
NEW YORK, Woolworth Bldg.

INDIANAPOLIS
Louisville, Ky., Frederick Wehle, Starks Bldg.
New Orleans, C. O. Hins, 504 Carondelet Bldg.
Birmingham, Ala., S. L. Morrow, 720 Brown-Marx Bldg.
DALLAS, TEXAS, 709 Main St

LINK-BELT

Digitized by Google



You've Got to Be *Good* to Get There

A man must have "something on the ball" these days if he is going to break through to any real success. It takes more than native ability, more than determination, more than experience, more than hard work. It takes *training*.

To-day 300,000 factories in America are looking for managers who know production—men, material, equipment. They want managers who think in terms of efficiency and economy as applied to actual manufacture. You can take our word for it or read it in articles in the magazines or in the speeches of men who know. It's true.

The reasonable conclusion, therefore, for the man who wants to succeed in the broad field of industry is that he must train himself for this great opportunity.

If you are that man and if this strikes you as good common sense, the Industrial Extension Institute can put you where you want to be.

Industrial Extension Institute

11-17 East 45th St. New York N. Y.

The Institute offers you the Factory Management Course and Service, an organized course of reading and study prepared by one hundred of the country's leading industrial specialists. Gantt, Towne, Steinmetz, Hunt, Ficker, Payne, Babson, Going are among the famous Industrial Engineers who have put their combined brains and experience into this course.

Thousands of industrial executives have enrolled. Hundreds of great corporations have used the course to improve their organization.

It's here for you. Three or four hours a week of earnest study plus your ambition gets you there in a big way. Use the coupon— now.

Industrial Extension Institute
11-17 East Forty-fifth St.,
New York City.

Please send without obligating me, full information about the Factory Management Course and Service.

Name .....

Home Address .....

Position .....

Company .....

Digitized by Google

THE MOST ECONOMICAL AIR COMPRESSOR AND VACUUM PUMP NASH HYTOR

THE HYTOR COMPRESSOR is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

The rotor, the only moving part, is cast in one piece, the blades being rigidly reinforced by shrouds. The rotor is mounted on a short, stiff shaft supported at each end by the highest grade annular ball bearings mounted outside of the casing.

As the peripheral clearance is large, there is no possibility of the ends of the rotor blades coming in contact with the casing.

The original high efficiency is maintained indefinitely in continuous service.

The air is thoroughly washed during compression and contains no oil.

Hytor compressors occupy very much less floor space and are much lighter in weight than reciprocating compressors. They run without vibration.

The cost of installation is greatly reduced as no expensive foundations are necessary.

No expert attendance is required as there are no adjustments to make. The cost of upkeep is negligible.

Hytor compressors are quiet in operation.

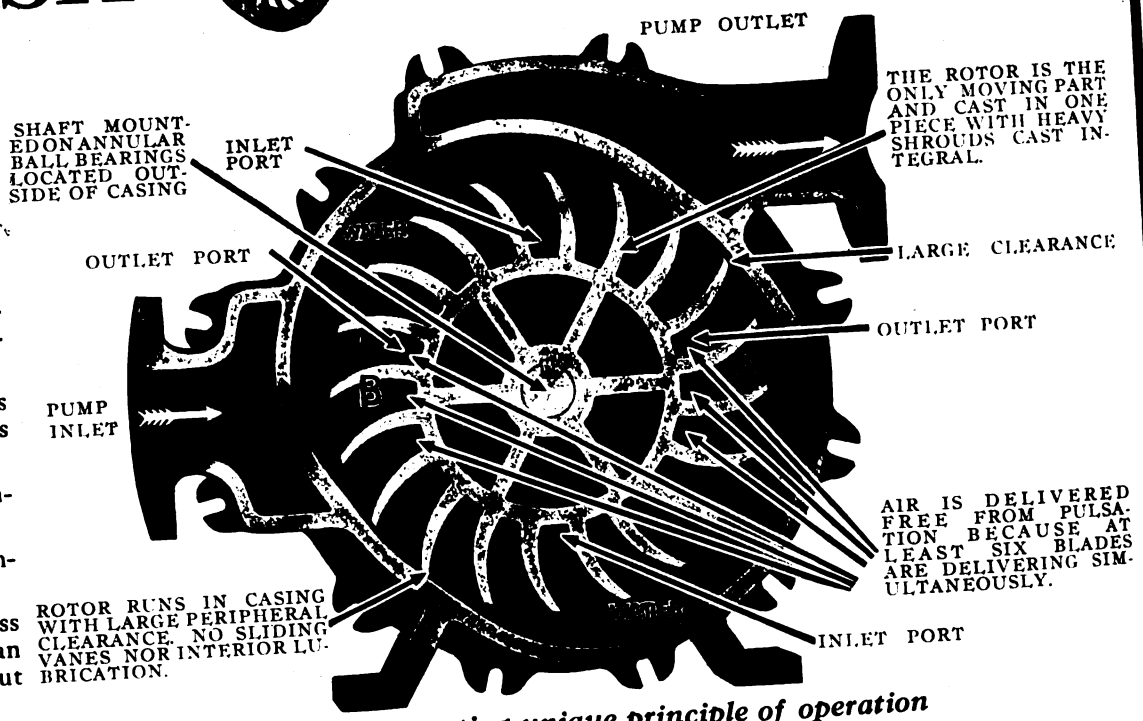
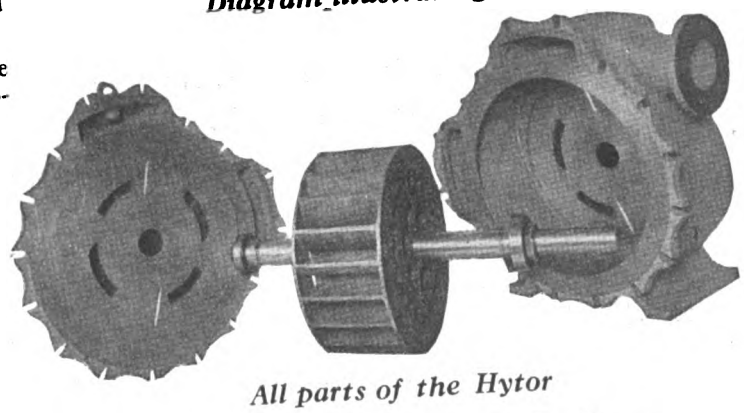


Diagram illustrating unique principle of operation



A ROTOR in hydraulic balance revolves freely in an elliptical casing filled with water. The water, turning, with the rotor, and constrained to follow the casing by centrifugal force, alternately recedes from and is forced back into the rotor, twice in a revolution. As the water recedes from the rotor it draws in the air through the inlet ports. When the water is forced back into the rotor by the converging casing, the air is first compressed and then discharged through the outlet ports.

This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

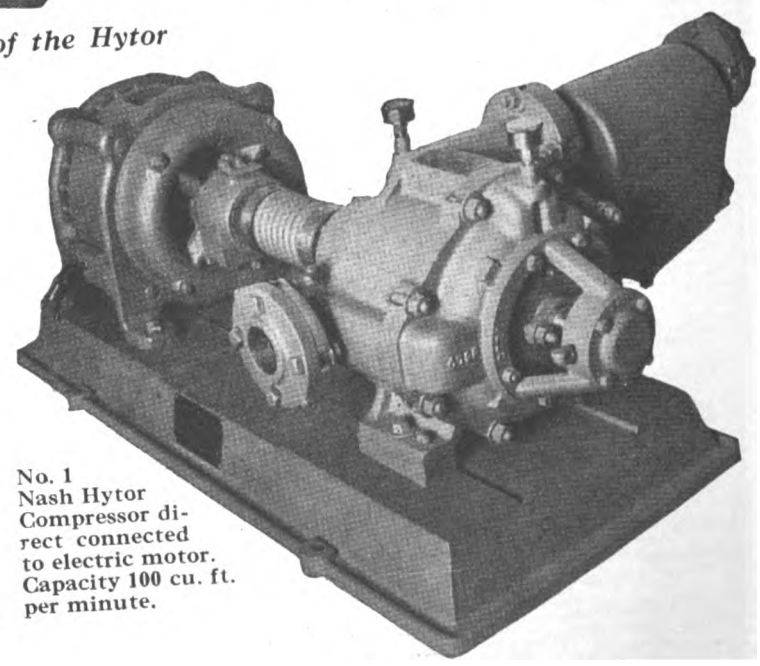


All parts of the Hytor

At pressures up to and including 15 lbs. per square inch, and vacuums up to 20 inches of mercury, the Nash Hytor affords the simplest and most economical means for handling air or gas, for all of the usual purposes where air under pressure is required, and they can be used on many special services for which the ordinary compressor is not adapted.

It is common practice in handling mildly acid vapors to re-circulate thru the pump an alkaline solution for the protection of the cast iron structure of the pump. In handling chlorine gas, concentrated sulphuric acid is re-circulated.

Air handled by the Hytor is delivered absolutely clean and free from dust and oil; a great advantage in the agitation of good products or in absorption processes where diffusion of air is accomplished by blowing thru filters, porous blankets or small orifices.



No. 1 Nash Hytor Compressor direct connected to electric motor. Capacity 100 cu. ft. per minute.

6

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps
- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps

NAME.....
POSITION.....
COMPANY.....
ADDRESS.....

NASH ENGINEERING CO.
SO. NORWALK, CONN. U.S.A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

What Lies Ahead?

IT is true that, in the light of past practice and present knowledge, we have made great strides in conserving our power resources. We take just pride, for example, in such remarkable achievements as that of the Ford Motor Company in its River Rouge Power plant. Yet, as a matter of fact, we have so far concerned ourselves only with the *conservation of resources;* we have not even begun to attack the larger problem—the *conservation of energy.*

For many thousands of years, mankind has lived and grown and multiplied, deriving the energy necessary for existence and growth from the products of agriculture. Nature provided a complete cycle of events to make this possible: man (together with all animal life) burns up as food the vegetables and plants, utilizing their energy and giving off carbon dioxide and water as waste products; the vegetable kingdom, acuated by energy from the sun, converts these waste products again into food and fuel—a process called "photosynthesis." Without solar radiation, however, the vegetable kingdom cannot function. Thus, all the energy in our foods, as well as all the energy in coal or oil, is in fact but so much stored-up energy originally derived from the sun.

So long as civilization was based upon man-power and beast-power—animal energy—it was self-supporting; the energy consumed was less than the solar energy simultaneously being stored up through photosynthesis But today's civilization is not based upon animal power; it is to an ever-increasing degree dependent upon mechanical power—dependent at present upon the energy derived from coal and oil as fuels. And, whereas Nature provides each year a new crop of the fuel which supplies animal energy, she has produced, in countless thousands of years, but a single "crop" of the fuel from which we derive mechanical energy.

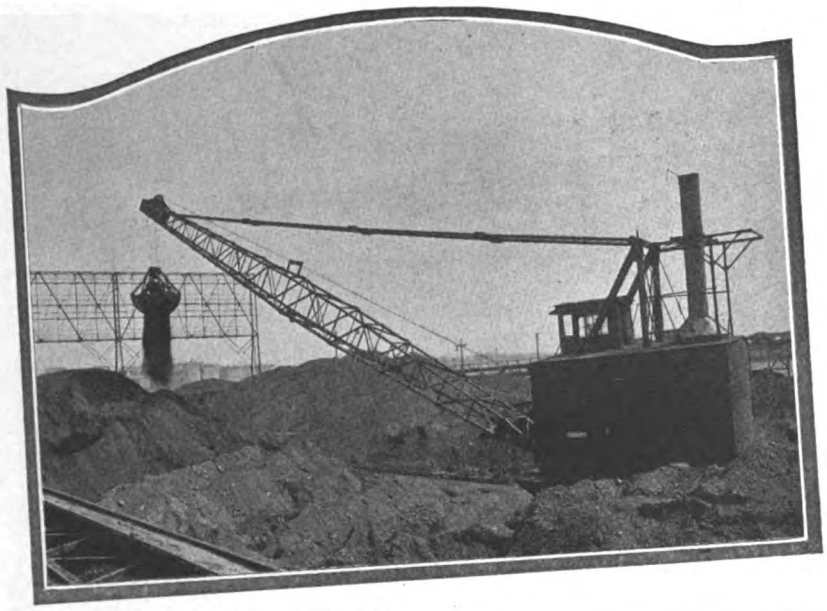
Occasionally one hears it said that man has progressed so far, achieved so much, that there are few problems left to solve. Right here, however, is a problem beside which all the accomplishments of the past sink to insignificance:—when we have exhausted all the energy stored up in the form of coal and oil, where shall we turn for the mechanical energy on which our civilization hinges? Perhaps we shall discover a form of vegetation which can be economically grown and used for fuel; perhaps a cheap and prolific crop that will render a high yield of industrial alcohol. Both of these paths are under investigation by scientists, and the latter seems to hold out some promise.

Whatever the solution may prove to be, here is a problem for those jaded intellects which sigh for new worlds to conquer and complain that nothing really vital remains to be done.

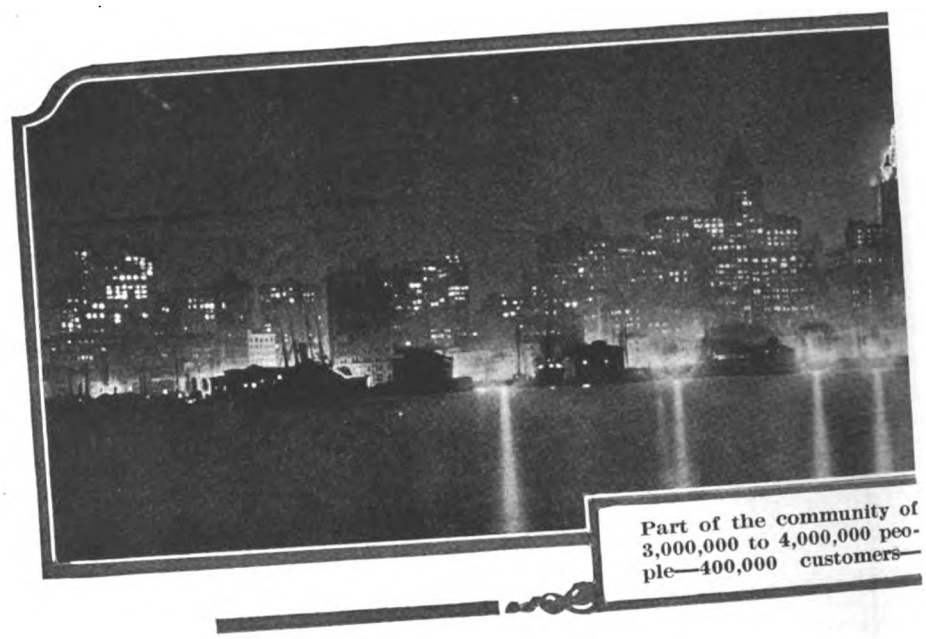
Digitized by Google

Putting Coal on
Light, Heat and Power for the

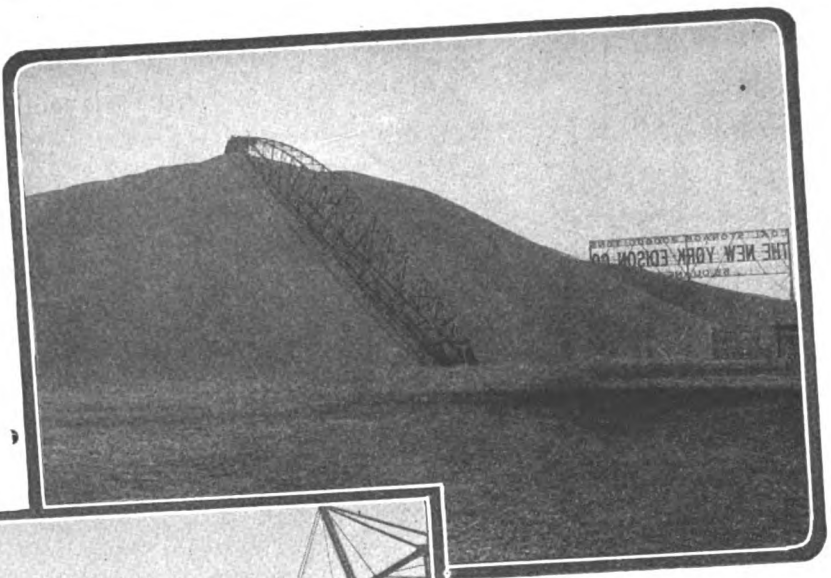
By Louis Resnick



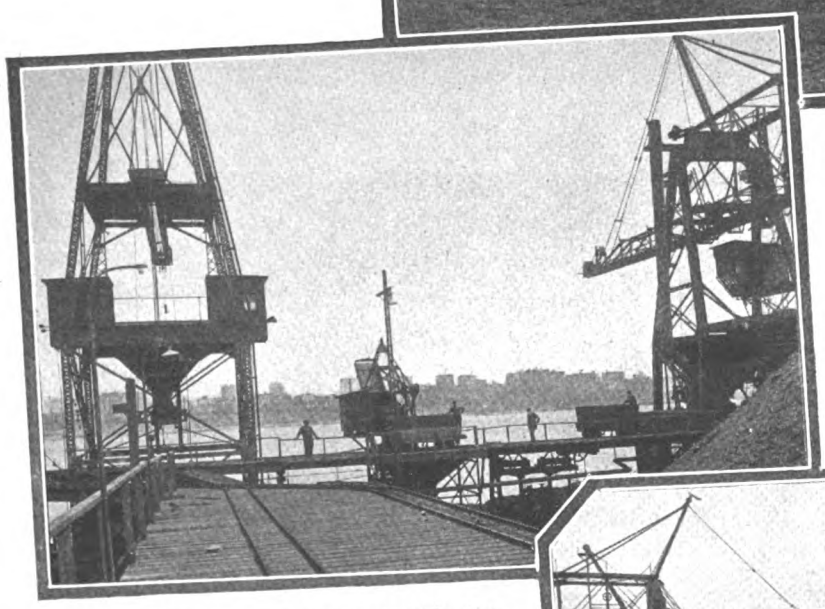
It is estimated that there are about 5,000 tons of coal in these piles; That is the raw material which The New York Edison Company each day converts into more than 6,000,000 kilowatts of electrical energy.



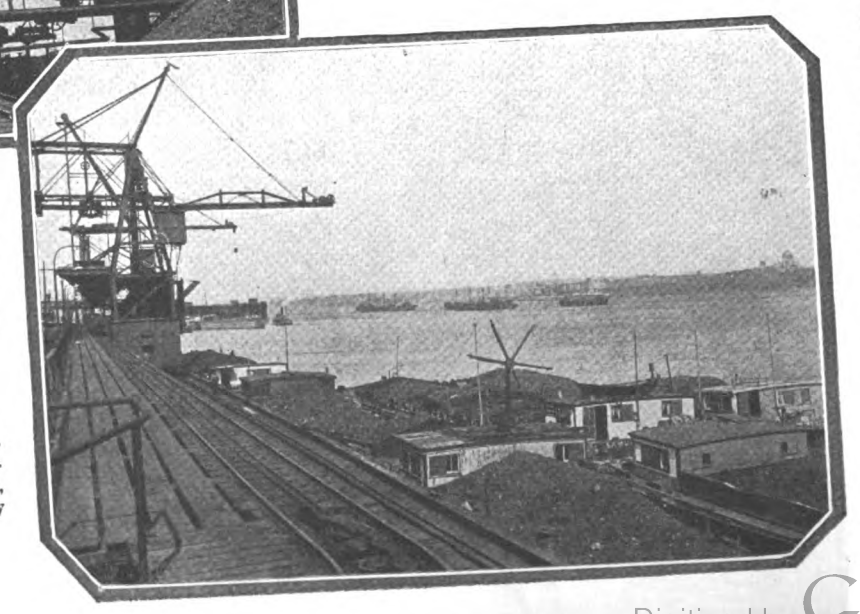
Part of the community of 3,000,000 to 4,000,000 people—400,000 customers—



Another pile of 67,000 tons at Shadyside.



The hoisting tower and the waterside terminal of the bridge-tramway which, together, enable Shadyside to load or unload 2500 tons of coal in ten hours. In numerous emergencies, when New York's coal supply has been shut off by strike or storm, the loading equipment at Shadyside has been operated for twenty-four or forty-eight hours without a stop.



Twelve mines send the coal required to feed the furnaces of Waterside. The daily supply, six bargeloads, on the dock at Shadyside, N. J., where an emergency supply of 200,000 tons is stored.

GIVEN 5,000 tons of coal a day, and a community of three to four million people requiring an unfailing supply of electrical current for light, heat, and power, convert the coal into something over 6,000,000 kilowatts of electrical energy and deliver it safely and at a uniform voltage to some 400,000 customers; if a storm or London fog comes up, find out about this an hour before the rest of New York does and, if necessary, be prepared to carry your peak load for twelve hours at a stretch instead of one; and, finally, keep on hand in an accessible place enough emergency coal to carry you through any coal famine, be it the result of railroad strike, miners strike, harbor tie-up, or any other cause.

That is part of the problem confronting The New York Edison Company every day in the year, the part that this article will attempt to describe. The various other phases of the problem—showing 400,000 customers how to make the most economical use of a commodity that none can see and comparatively few understand; making the customer realize that his meter registers whether he or the scrubwoman uses the service; supplementing electric service with all the personal service necessary to please the whims of millions; doing all this today at a lower cost to the consumer than ever before—are all interesting, bu

Digitized by Google

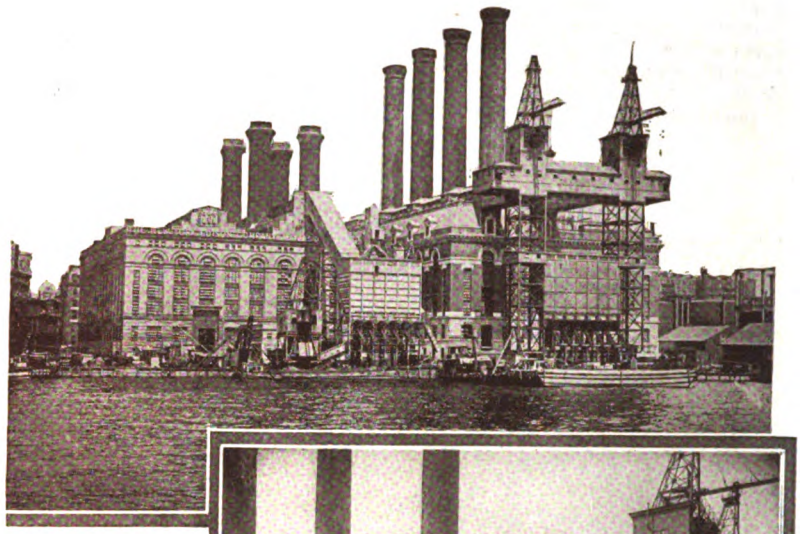
on the Wire

the World's Largest City

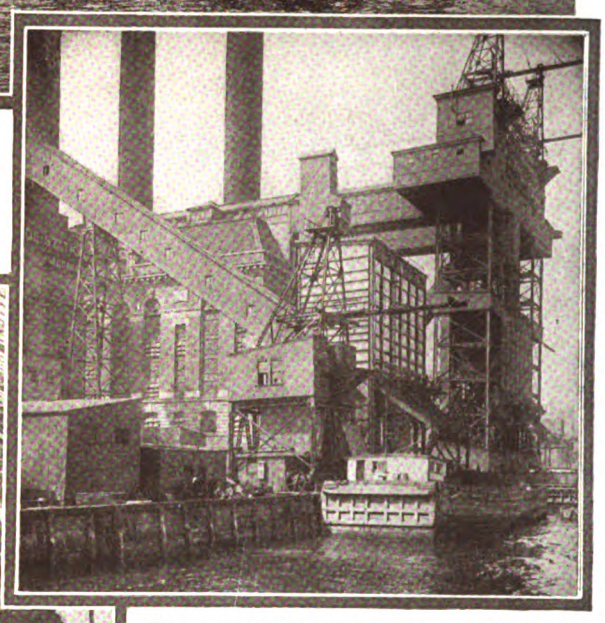
RESNICK



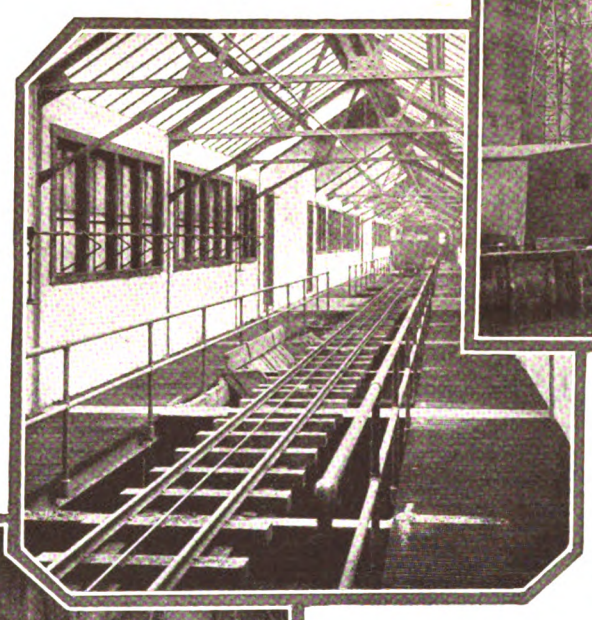
dependent upon one central station system for light, heat, and power.



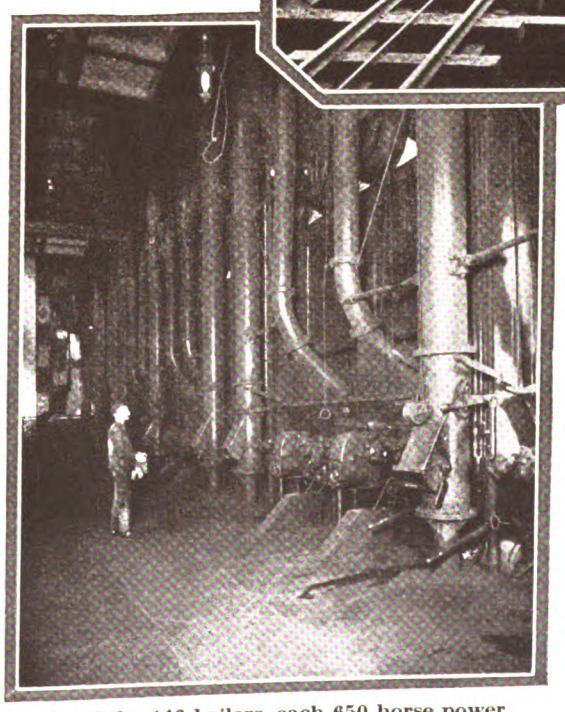
These two buildings, operated as a unit, contain what is probably the largest battery of turbine generators in America, 20 machines with an aggregate capacity of 324,000 kw.



Closeup of the coal tower at Waterside where three buckets, each taking a ton and a half at a time hoist the coal from barges 180 feet above the water in 30 seconds.

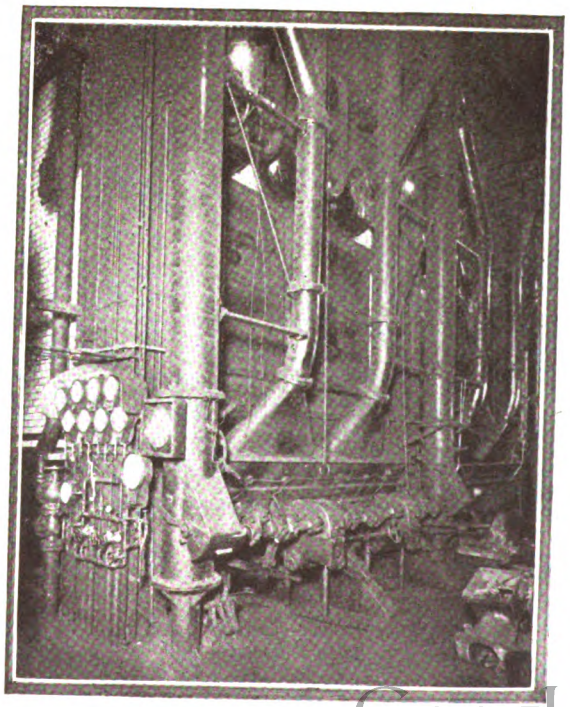


The cable car system at Waterside where automatic trips drop the coal into the bunkers needing it.



Six of the 146 boilers, each 650 horse power, which carry out the first step in the process of putting coal on the wire by producing the steam to drive the turbine generators. The clean hands, face, and polished shoes of the workman in the foreground are symbolic of the modern boiler room.

The centralized air control system (lower left) which enables one man to regulate the air for all 92 boilers in Waterside No. 2 and another man to control the air for the 54 boilers in Waterside No. 1.



it would take as much space to tell the story of each as it does to tell how the central station puts coal on the wire.

The particular central station described in this article is known as Waterside No. 1 and Waterside No. 2 extending from 38th street to 40th street and from the East River to First Avenue, New York city. Although it is one of the five generating stations of the New York Edison system (The New York Edison Company and the United Electric Light & Power Company), it takes care of approximately half of the entire load of that great system. It is the direct successor of America's first central station, built under the personal direction of Thomas A. Edison at 257 Pearl street, New York city, in 1882.

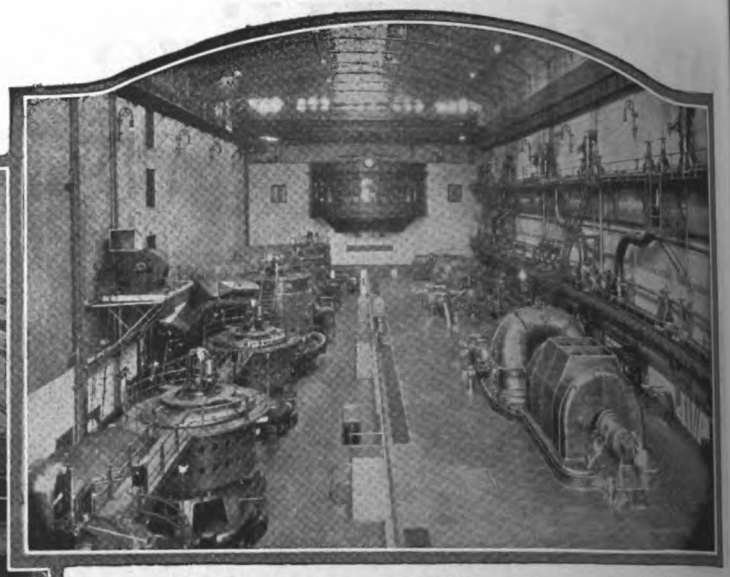
Twelve mines send the coal required to feed the furnaces at Waterside. Some of it, 2,500 tons to be exact, is delivered daily direct to the power plant and stored in concrete bunkers above the furnaces; the excess is stored on a 25-acre tract at Shadyside, N. J. on the Hudson River opposite 112th street, whence it is delivered by barges to the various generating stations of The New York Edison system, all of which are on the river front.

Half a million tons of coal pass through the storage yard at Shadyside each year; approximately 200,000 tons are on hand there at all times, and

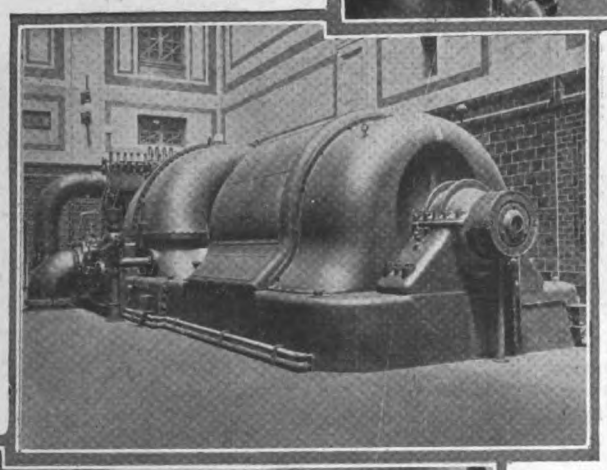
Digitized by Google



The generating room of Waterside No. 2. These two rooms, which are operated as a unit, probably constitute the largest turbine-generator battery in the country, the twenty generators in the two rooms, having a capacity of 324,000 kilowatts.



The turbine generator room at Waterside No. 1. Cables conduct the current from the generators, through reactors, oil switches, and buses, to the distributing stations about the city. The operation of this room is directed from the balcony extending into the room on the far wall.



A close-up of the machine which creates electrical energy and starts it on its journey on the wire, one of two 35,000 kilowatt horizontal turbine generators at Waterside.

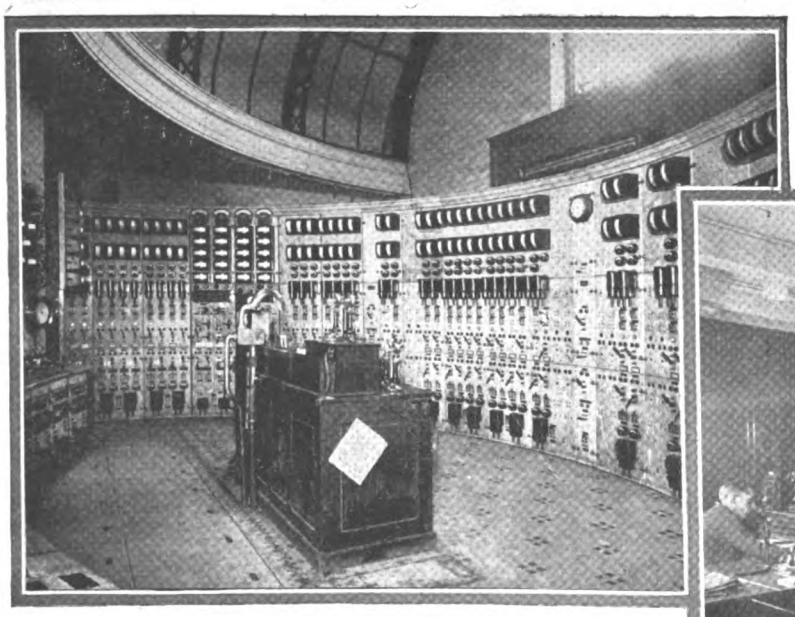


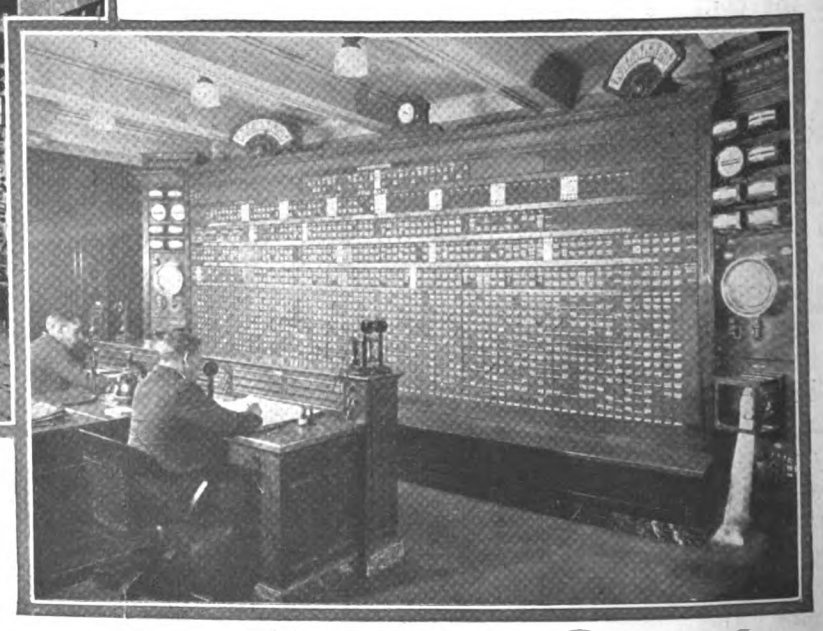
Close-up of the gallery from which the operation of the generating room is directed, and below, inside this gallery.



How many thousand kilowatts of electric energy do the lights in these buildings in lower Manhattan represent?

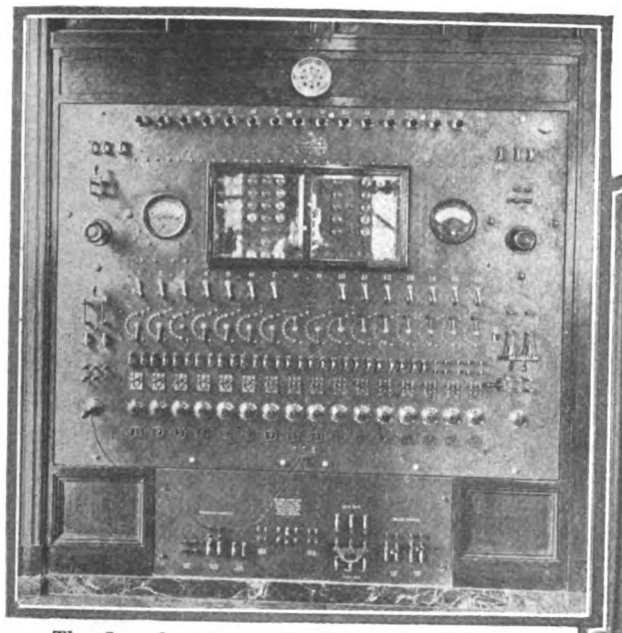
25,000 tons are always on the dock ready to be rushed to the generating stations in an emergency. With two pieces of equipment on the dock, a bridge tramway and a hoisting tower, Shadyside can load or unload 2,500 tons in ten hours. Two 100-foot locomotive cranes and a cable car system of 21 three-ton cars complete the mechanical equipment of the yard. A force of less than 40 men receive and ship the 500,000 tons of fuel turned over annually at this yard, and the six mountains of coal in this yard are almost entirely free of the spontaneous combustion smoulderings common to such quantities of bituminous. If you ask old George McKnight, superintendent at Shadyside, how he accounts for this, he will answer in one word: "Experience." Then he will go on to tell you that he has seven men there today who were there when he came to Shady-



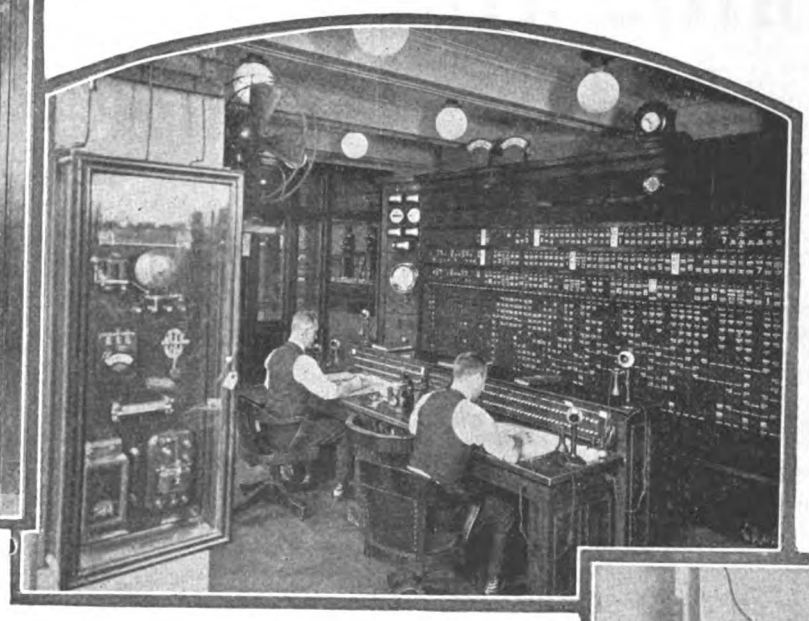


The nerve center of the entire New York Edison system. The condition of every boiler room, every generator, and every distribution line, is indicated on the System Operator's board. Direct telephone connection with eighty men through the switchboard on his desk, and a fire alarm signal system at his right gives the system operator a means of instantaneous communication with any one or all his stations. A wireless storm detector behind him warns him of approaching storms and darkness an hour or more before the clouds have reached New York City.

Digitized by Google



The fire-alarm signal system in the System Operator's room at Waterside which enables him to send any one of several score messages to any group of four stations or all the stations on the system.



Two forms of storm detectors in use at Waterside. When a storm is brewing anywhere in the vicinity of New York City the bell on the storm detector warns the system operator of the approach of clouds by ringing at the rate of, perhaps, once every minute or half minute; as the storm gets closer to New York the bell of the storm detector rings at shorter intervals. Prior to the installation of this device it was customary at Waterside to have a man stationed on the roof of the building almost constantly during the day on the lookout for dark clouds.

side 19 years ago, and that there is not a man in the yards who has been there less than three years. But we must get back to the actual process of putting coal on the wire.

The raw material of the central station is delivered to Waterside in barges carrying 800 to 1,500 tons each. Three buckets, each taking a ton and a half at a bite, hoist the coal 180 feet above the water, swing it into the coal tower, and empty it into hoppers leading to the crushers. The buckets make the 180 foot trip in 30 seconds. As quickly as the coal is dropped into the tower it is, in one continuous process, pulverized, loaded into cable cars, weighed, started on a circuit of the building over the bunkers, and at intervals along the track dropped into the bunkers by automatic trips. It requires only six men to transfer 2,500 tons of coal from the

(*Continued on page 41*)

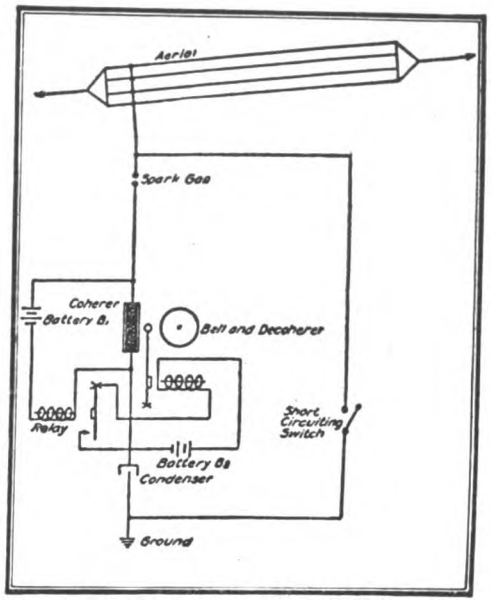
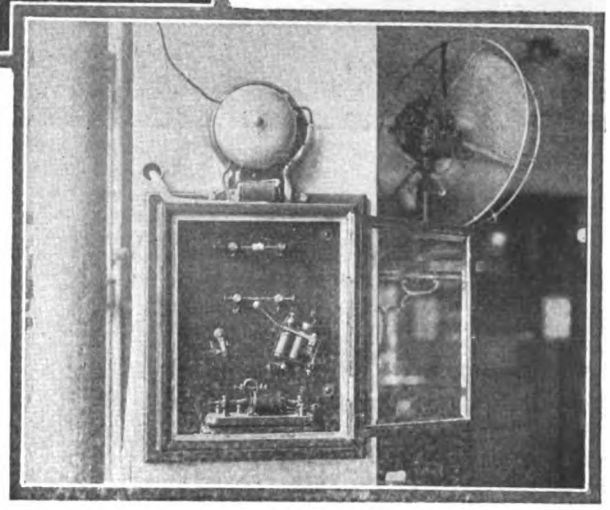


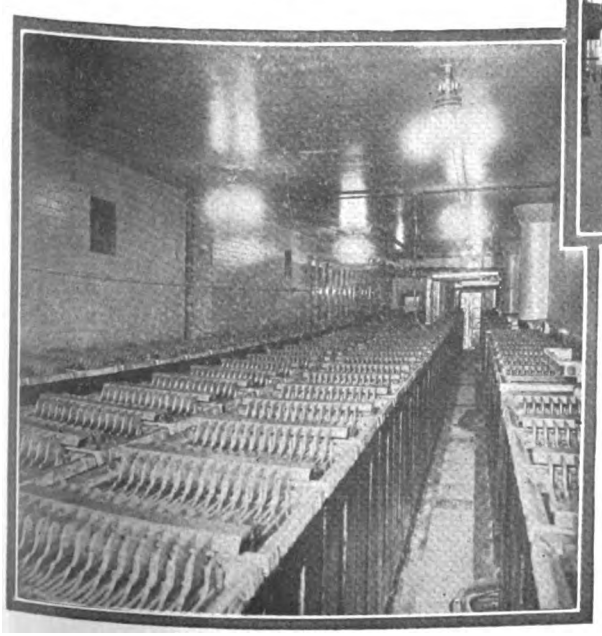
Diagram of the construction of the wireless storm detector. Since electrical energy cannot be stored in any large quantities, the central station—if it is to be operated at all efficiently—must vary its production of current as directly and as quickly as the demand for current varies.





The sub-station receives the current from the generating station in the form of alternating current of 6600 or 11,000 volts; it transforms this into direct and in some districts into alternating current of 120 volts and distributes this to the network of underground feeder boxes.



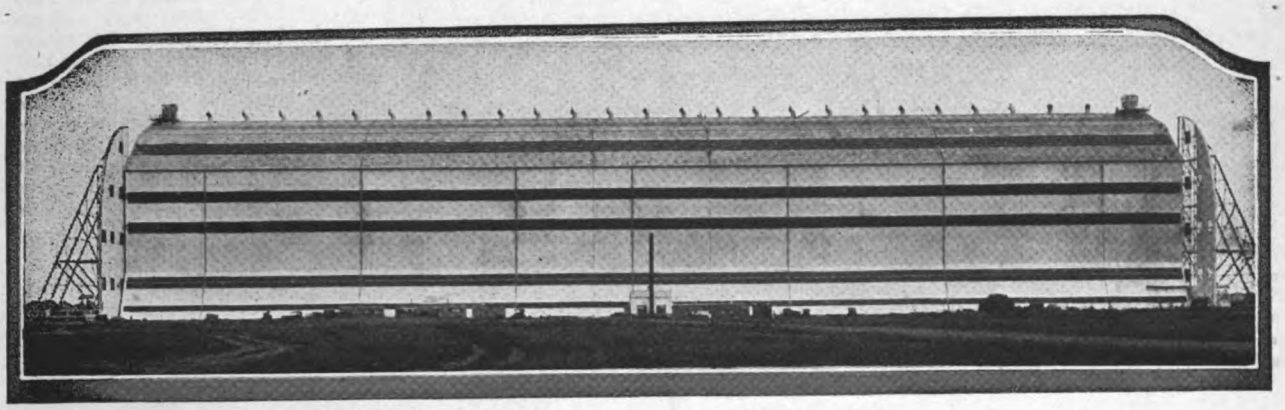


One of several storage battery rooms in each sub-station of The New York Edison Company, at the left. These batteries could carry the entire load of the sub-stations for a period of five to seven minutes, though the emergencies for which they are provided rarely last more than a minute.

Digitized by Google

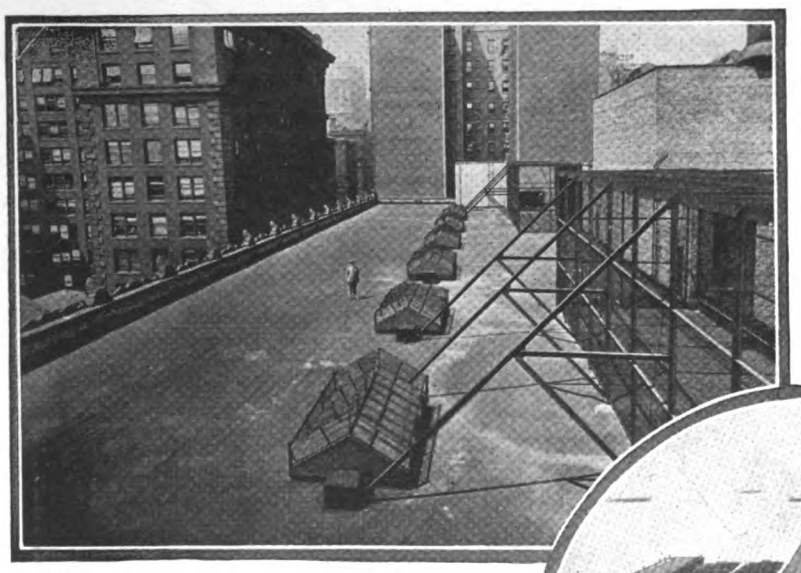
Roofing the Old and the New Buildings

By W. Thomson Lees



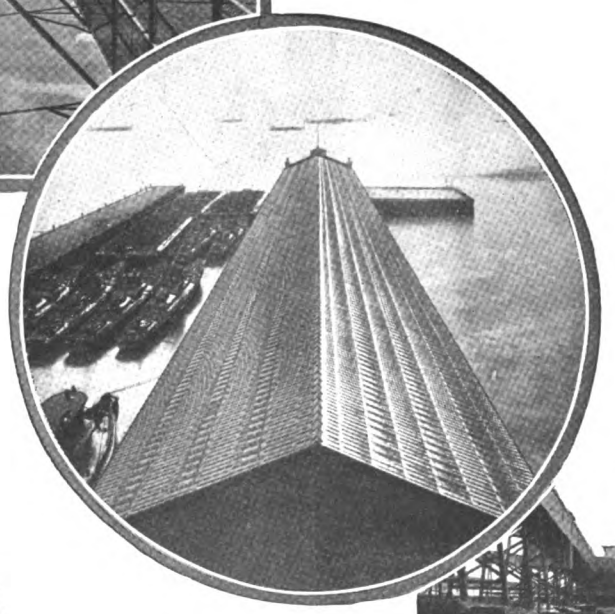
The dirigible hangar at Scott Field, Belleville, Ill., not only has the largest floor area (as mentioned in a previous issue) but has the largest roof in the world. Cement tiles and glass tiles—a total of almost 27,000 of them—furnish protection, with daylight illumination. The siding is of corrugated asbestos-protected metal.



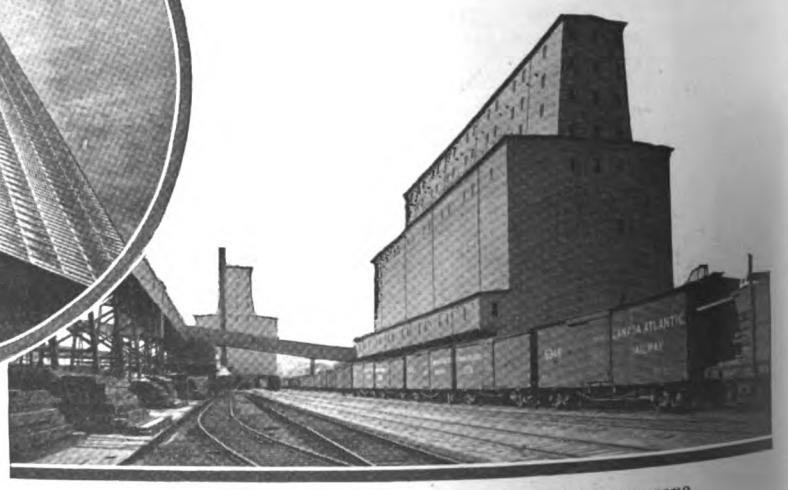


Above is an example of asbestos roofing of the ready-to-lay type, slate surfaced, as used on a group of Cleveland Tractor Co. buildings. This makes a durable, neat, easily applied roofing for buildings of this type.

Where large flat areas are exposed to smoke and acid fumes and severe service, the "built-up" type of roofing, with asbestos and asphalt, is probably the nearest approach to permanent weather protection; an example being the Chicago Western Union Building, above.



In the circle is one of the E. W. Bliss Co. buildings, exposed to marine atmosphere, and roofed with cement tiles; not only architecturally beautiful, but unaffected by fumes or climate, and therefore particularly adapted to the purpose.



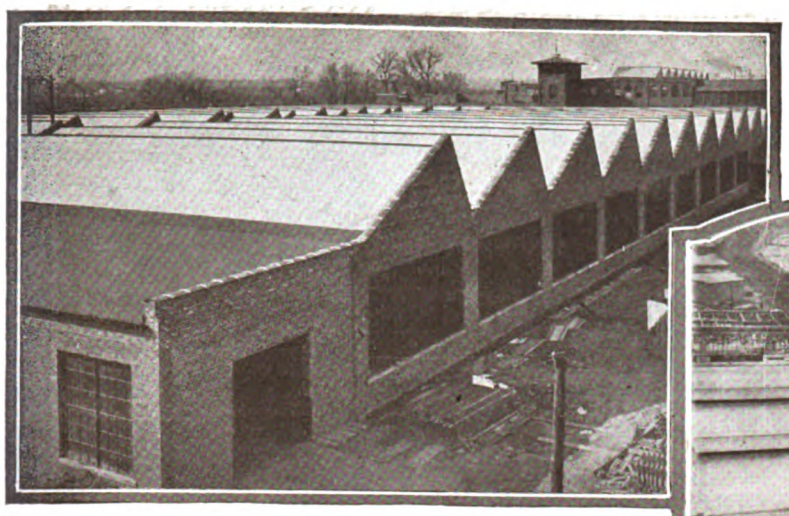
The old-time "tin roof" has by no means gone into the discard; as witness this grain elevator of the Grand Trunk Railway, Portland, Me. Sheet metal roofing, today, has the benefit of much research in the production of durable sheets of uniform quality.

WE install a machine, and give it constant attention and inspection; we install a concrete, or wood block, or some other type of floor, and because this floor is constantly under observation, it is kept in a fair state of repair. But, in most industrial plants, when we install the roof we immediately proceed to forget about it. And that is one of the chief things contributing to the high cost of roof maintenance. That, and one other thing:—A very general lack of knowledge of roofing characteristics on the part of the average plant manager.

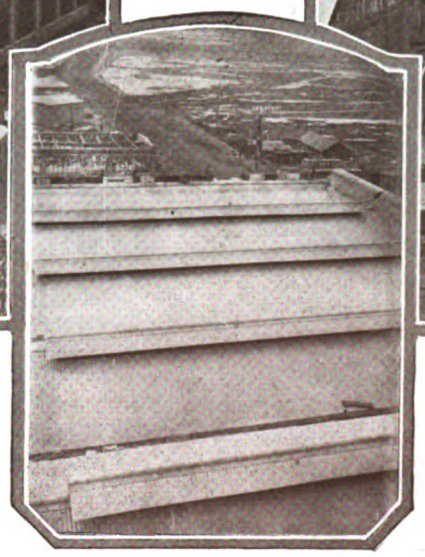
There is no such thing as a really permanent roof—one which can be installed and never thought of again during years and years. There is no such thing, either, as *one best roof* for every purpose. It is, however, possible to approach very closely the ideal of a "permanent" roof for any specific conditions of service. But whether this permanency lies with sheet metal, asbestos, concrete, asphalt, tile, or one of the many other materials available, is a matter depending upon these aforesaid specific conditions.

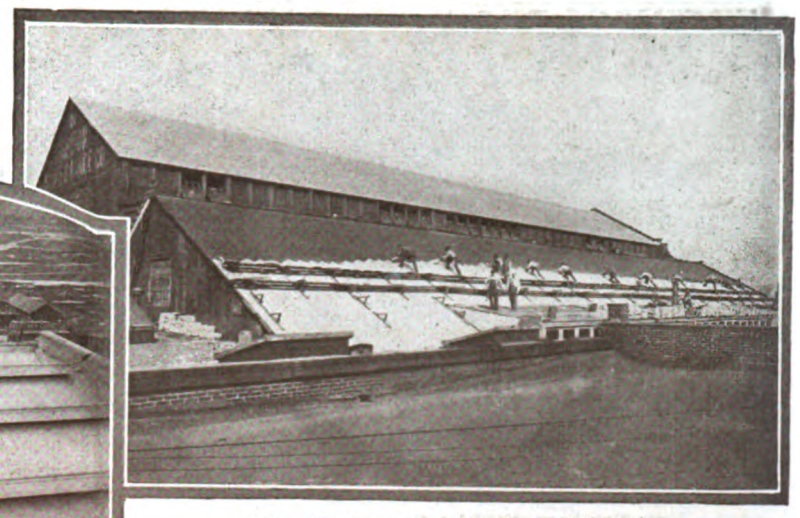
In the early days of industrial development in this country there were but three kinds of roofing in general use: The

Digitized by Google



Another type of "ready-to-lay" asbestos roofing; made black on one side, white on the other, and which can be used either side to the weather. Here, at the plant of the Holt Mfg. Co., Peoria, Ill., the white surface makes a splendid light reflector on a saw-tooth roof.





One of the advantages of asbestos shingles, is the ease with which they may be applied over old wooden shingles—as shown above at the Monitor Stove and Range Company's plant.

slate roof, the so-called "tin roof," which was really made of sheet iron or sheet steel, and wooden shingles. Tile roofs were little used, because of their relatively high cost.

We still find examples of all three of these types in use today; though the fire hazard is driving wooden shingles into the discard, as far as industrial buildings are concerned.

Each of the three original roofing materials had certain advantages to commend it. The wooden shingle was easy to apply, extremely light in weight, and could be installed and kept in repair by any average handy man. Today, doomed by its fire-inviting characteristics, the wooden shingle gives place to a host of different makes of "ready-to-lay" roofing. These modern successors to the light-weight, easily applied shingle of wood, run all the way from rolls of prepared felt (incorporating more or less asbestos and tar) to squares of varying sizes, individual asbestos-base shingles, and so on. The variety is so great that no one need

At the left is a sheet metal roof—so-called "tin" roof—on the Commonwealth Fish Pier, Boston, Mass. Note the ventilating provision at the ridge of each section.



Glazed cement tiles are not confined to piers and dirigible hangars, by any means. Here for instance, is an example of an attractive treatment of saw-tooth construction.



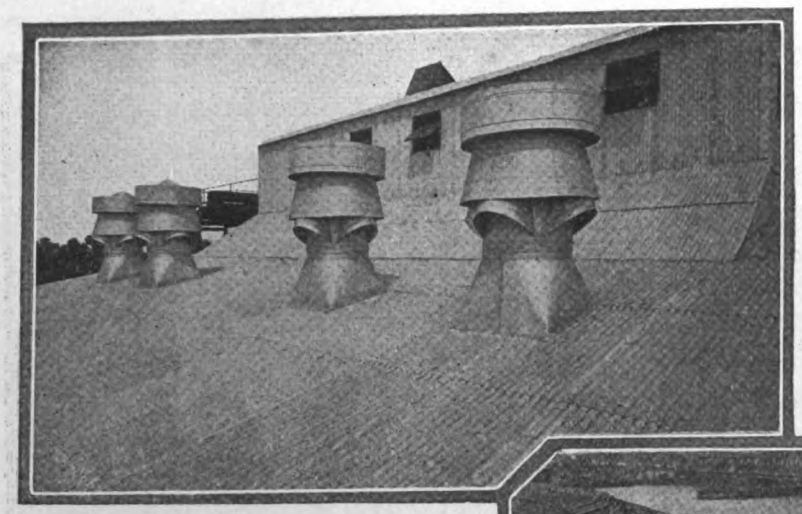


When a built-up roof begins to show bald spots, as above, the easiest way to remedy it is by applying a specially prepared liquid—which is brushed on—and the roof assumes the respectable appearance shown at the left. More important it is a permanent repair.

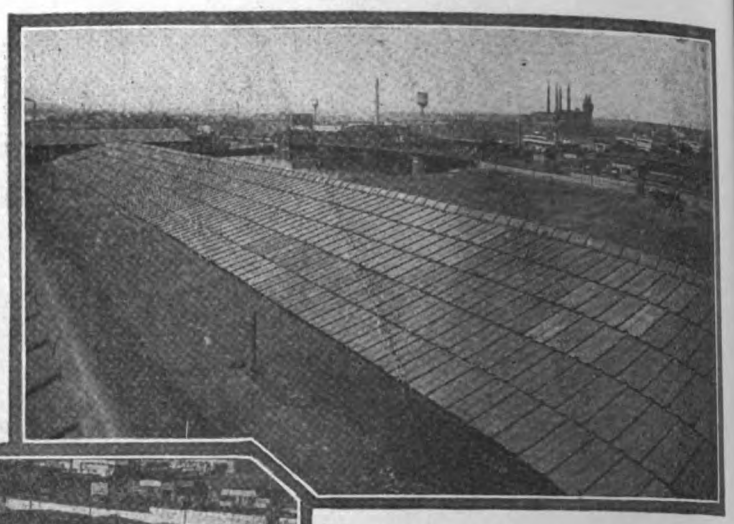


A feature of interest about the roof at the left (on the Monangah Glass Co. plant, Fairmount, West Va.), is that it requires neither paint nor gravel surfacing for protection—being made of natural asphalt. While not especially beautiful, such a roof resists both wear and the elements to a superlative degree.

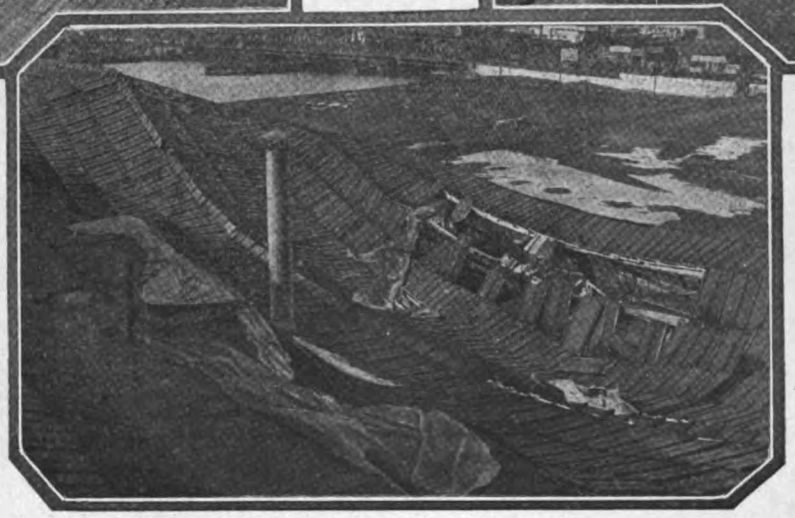
Digitized by Google



Both roof and siding on this building of the Iowa Southern Utilities Co. are of corrugated asbestos composition—asbestos fibre and Portland cement, united under hydraulic pressure. Rot-proof, with nothing to rust or decay, its natural gray surface requires no painting or other protection.



Above is the same roof as shown at the left; reconstructed after the fire.



A fire at the Ford plant in Kearny, N. J., burned away the timbers, but it seems to have had little if any effect upon the cement tiles which comprised the roof itself.

mourn the wooden shingle for lack of substitute.

All of these prepared roofings have their uses, and generally speaking, all of them retain the advantage of lightness and ease of application. They range from the very lightweight, intended primarily for buildings of a temporary nature, up to material of sufficient thickness and surface protection to last for generations.

Sheet metal roofs — the standby of earlier days—fell into disrepute for a time. This was because when sheet metal was first made under quantity-production methods, the quality suffered. In later years, an immense amount of research has been done in this field, with the consequence that the sheet metal roof is once more taking its deserved place.

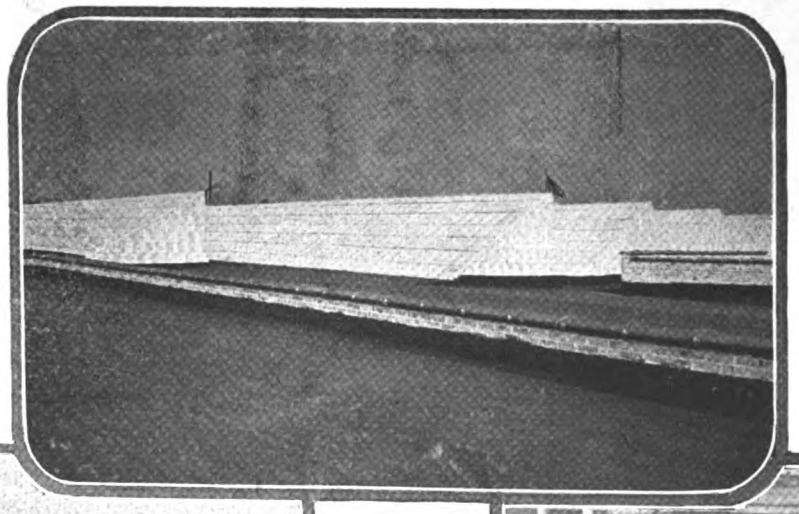
The forms in which galvanized sheet metal roofing is applied are many, including metal shingles, and metal Spanish tile. For industrial buildings, however, corrugated sheets are the most common form in use. Corrugated galvanized iron or steel sheets possess the advantages of great ease and simplicity of erection. They are comparatively light in weight and possess great lineal rigidity. In fact, except with light gauges, sheathing beneath such a roof is unnecessary. One and one-half corrugations side lap and from three to six inches end lap makes a good tight roof.

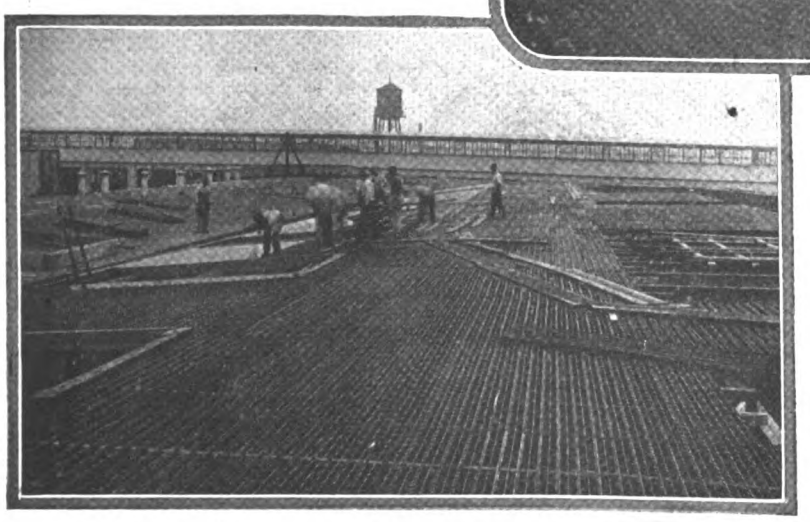
Good iron or steel of good weight properly coated with zinc, will give very satisfactory service. This zinc coating is applied by passing the carefully cleaned sheets through a tank of molten zinc and the zinc forms a thin coat which is a very real protection for the iron or steel base. The character of the metal under the zinc, however, is the big factor in the lasting qualities.

The proverbial "good sheet

(Continued on page 70)

Below—a combination of two types of asbestos roofing; built up asbestos felt and asphalt on the flat deck, and white-faced siding (for its light-reflecting qualities) on the saw-tooth structure.





The preliminary stage of constructing a co[illegible]e roof at the Elkhart Machine Co., Indi[illegible] ting down the special steel ri[illegible]



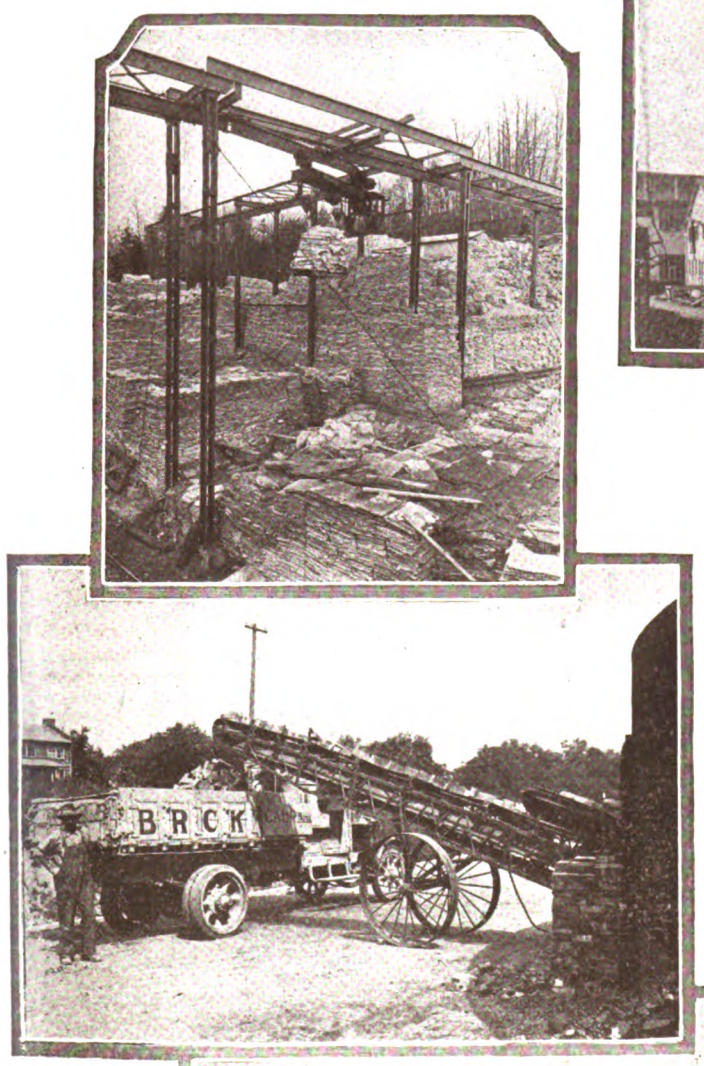
Applying concrete to the roof (shown in an earlier stage, at the left). The steel acts both as retaining form and as reinforcement.

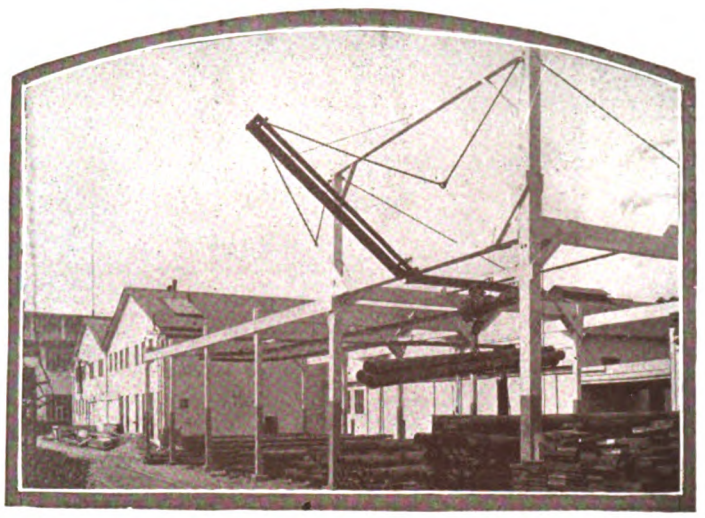
Digitized by Google

Storing and Handling Materials in the Plant Yard

BY JOHN HERBERT

In the yard of the Stevens-Thompson Paper Company, Greenwich, N. Y., this hoist carries pulp from mill to storage yard. It released five men when it replaced the wheelbarrow method.



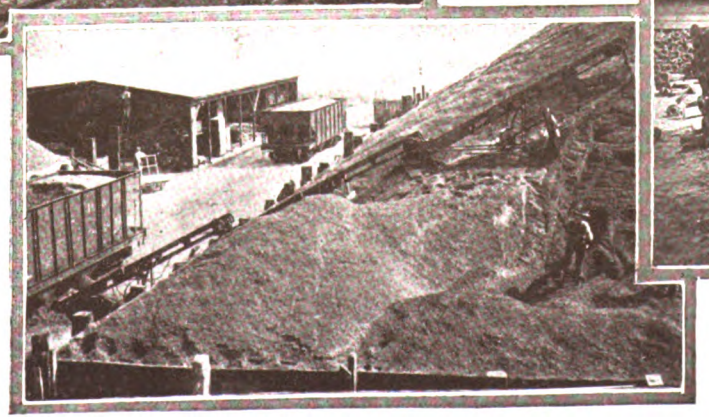


The economical handling of pipe is a problem in many plants. This is a very practical solution for that problem. It shows the practice at the Byron Jackson Iron Works, Berkeley, Calif.

Even brick are today handled automatically. This portable loading machine takes the place of a regiment of hod carriers and doesn't belong to the union.



A long ride for little money is being given to the ore contained in the bucket of the electric hoist, shown in the picture at the left, in the yards of E. J. Levin Company, of Plymouth Meeting, Pa.



It is not hard to move mountains today. This mountain of coal is being moved by the motor-driven portable conveyors which load, unload, or transfer at the will of the yard foreman.



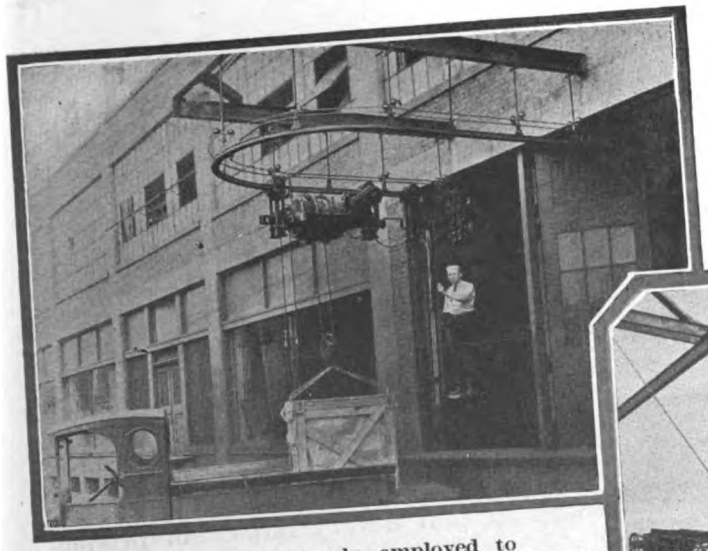
A somewhat unusual but quite practical and economical way of transporting and piling castings is here shown in which the electric tractor does both hauling and lifting.

THE modern plant or factory yard is not merely so much unoccupied land but a very important productive part of the "works." It is true that plant yards, so far as industrial history is concerned, extend back into the realms of antiquity, but the purposes that they fulfill today are entirely different from those that they served even ten years ago.

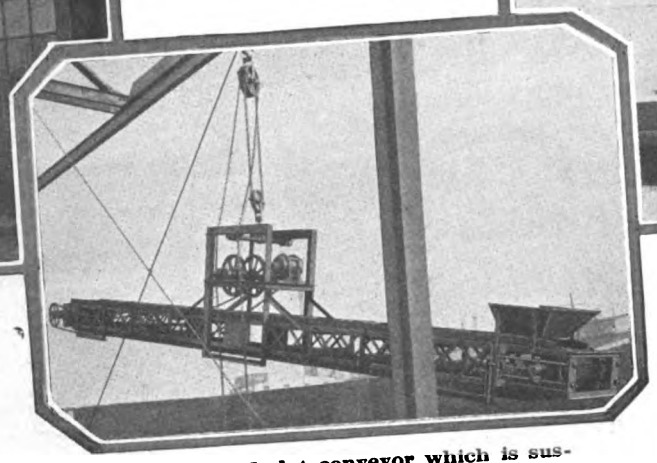
The old plant yard was merely a portion of ground not yet built upon. It was used as a place to dispose of things that one was not in a hurry for and that one did not consider sufficiently valuable to keep under the protection of a roof away from the exposure of the elements. Of course there were exceptions to this rule, not only in individual plants, but in the cases of certain materials. Coal, for example, has always been kept in the plant yard because that is usually the most convenient place to keep it.

But today the yard of the modern plant is much more than so much waste space or a mere junk pile or a catch-all for things that are conveniently forgotten. The plant yard is a real, a definite and a profitable manufacturing department—a part of the process, if you please. It has become so because of the remarkable

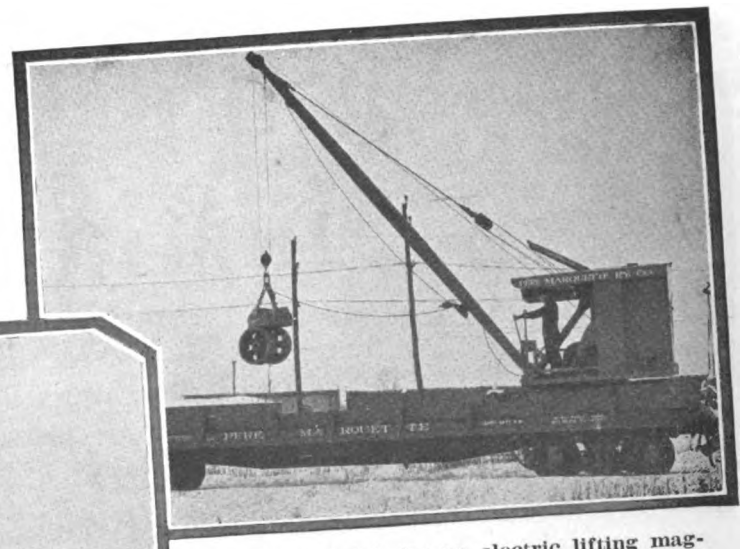
Digitized by Google



Four men were formerly employed to unload at this factory door. Now the electric hoist mounted on the monorail replaces three of them.



An overhead slat conveyor which is suspended from a monorail and which handles coke from cars to storage bins.



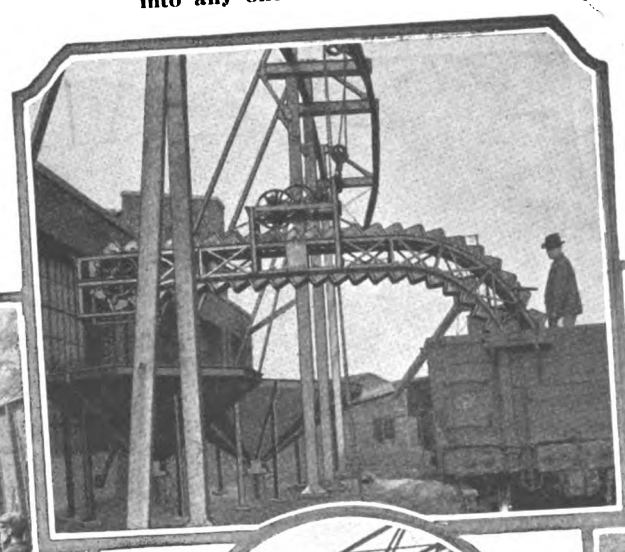
A novel job for an electric lifting magnet is that of hoisting the cast steel wheels shown in this picture. Very little contact surface is available.

development of materials handling apparatus.

With the exception of some plants located in cities or congested districts, where the land is worth as much or sometimes more than the buildings, the unbuilt-upon land adjoining the average plant is the least expensive part of it judged on a "square foot basis." Wise and far-seeing managers have taken advantage of this fact to enable the increase of production in their factories without running the danger of over-expansion through unwarranted building construction. They do this by thorough utilization of the plant yard, made possible by modern cranes, conveyors and tractors.

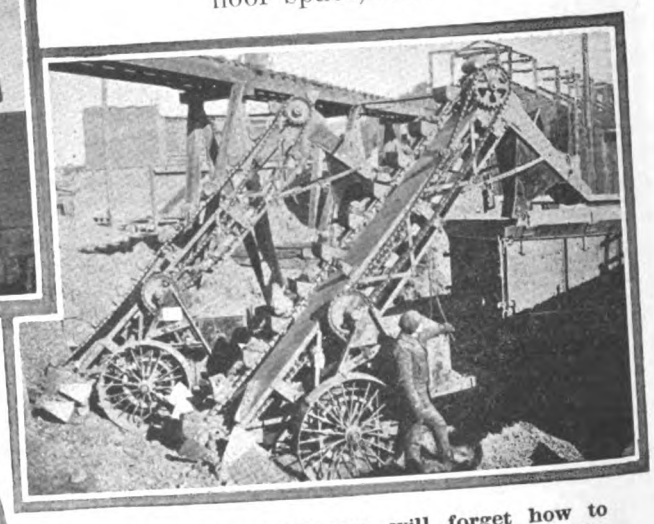
This proper utilization of yard space in connection with the full utilization of floor space in existing buildings will keep the investment in plant buildings down to a minimum, will decrease the manufacturing charge per square foot of floor space, lower the overhead

This Caterpillar type of bucket conveyor (below) is suspended from an overhead drag permitting the delivery of material into any one of the hoppers.

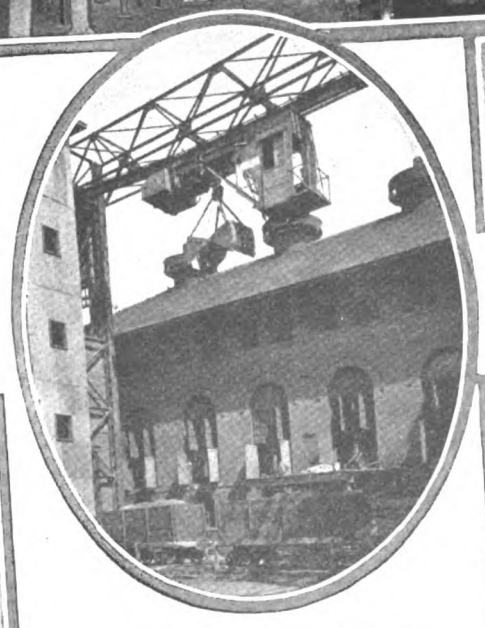




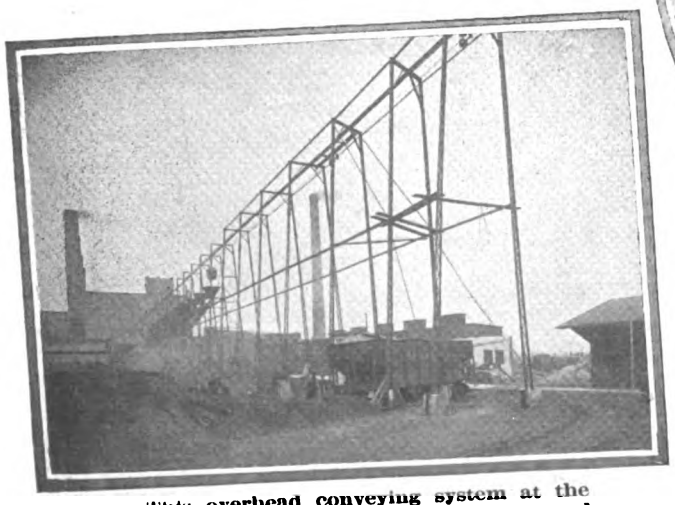
Dump cars have added range and flexibility when served by loaders such as this.



Before long laborers will forget how to handle shovels. Automatic loaders do the work so much more quickly and cheaply.



This three-ton hoist handles and mixes coke breeze and coal screenings at the rate of 50 tons an hour, delivering it to overhead bunkers in the power plant.

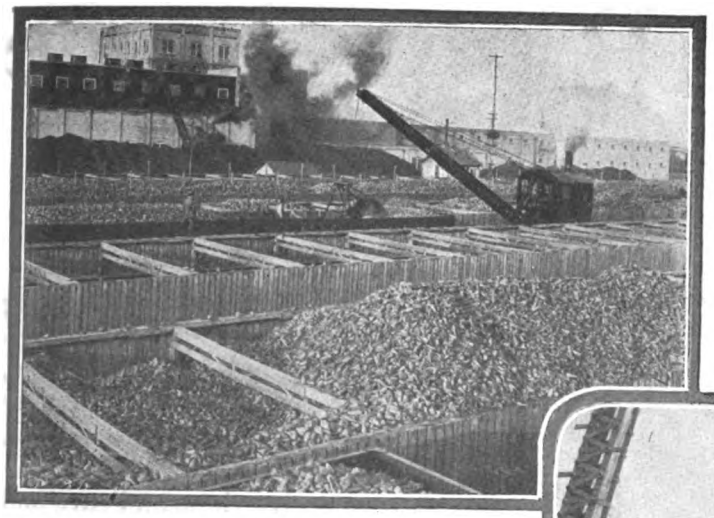


This overhead conveying system at the plant of the Columbia Stamping and Enameling Company is a means of delivering materials by hopper and chute to various locations as desired.



For storing and reclaiming large quantities of coal at low cost cable drag scraper systems have a number of advantages, particularly over the trestle method of dumping coal.

Digitized by Google



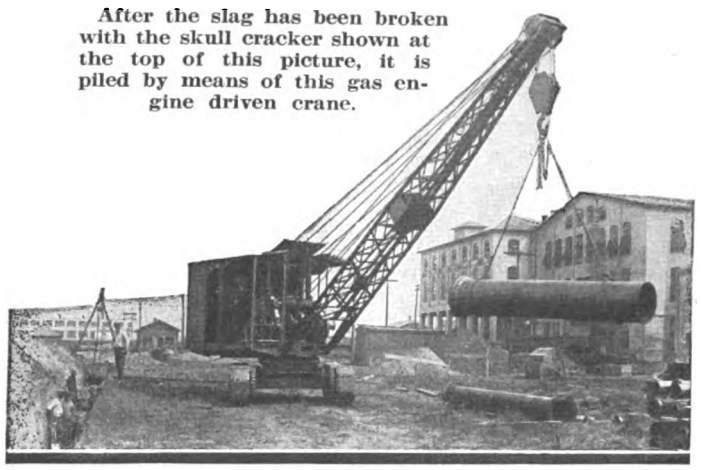
The piles of stock in the foreground look like coke but are, in reality, beets. One crane is transferring beets from car to pit, the other is transferring coal from pile to hopper.



Storage room under roof is not always necessary when you have a Gantry crane such as the above to run out into the yard and pick up what is needed.



After the slag has been broken with the skull cracker shown at the top of this picture, it is piled by means of this gas engine driven crane.



At the Kalamazoo Vegetable Parchment Company this crawler type crane excavates and handles pipe in connection with plant extensions.

percentage and reduce the cost of the product.

Many additions have been built to manufacturing departments that already have had more room than they needed. This was particularly true during the great boom of inflation when credit was easily obtained in unlimited amount. Hundreds of plants adopted hectic building programs to meet their apparent production requirements. As a result when the bottom dropped out of the inflated industrial structure these concerns found themselves with plants expanded to two or three times the normal requirements; and the excess capacity, not easily dispensed with, proved a serious liability, millstones in fact which pulled many a formerly sound company into the depths of financial troubles.

The first thing to do when it appears that the present factory buildings are becoming outgrown is to analyze the situation under two heads; first, how much space is being wasted in existing buildings under the present order and, second, how much of the industrial activities or functions can be cared for in the plant yard.

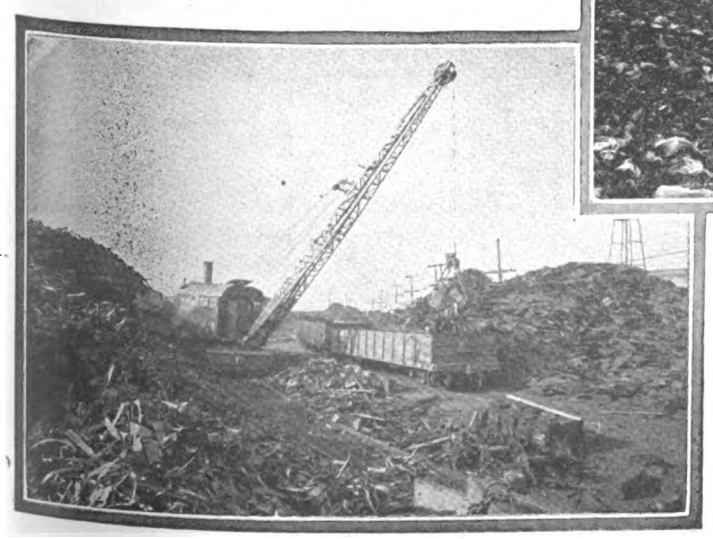
There are certain activities, of course, that must be carried out inside of a building. Workers must be protected against the cold that is experienced during winter seasons. Expensive tool equipment and semi-finished or finished stock cannot be exposed to the elements. On the other hand there are certain matters that can be cared for without inclosures or possibly with compromises in the form of roof shelters or platforms. One never has a very definite idea about these things until he stops to analyze the contents of one of his factory buildings.

In making such an analysis the first step is to analyze the functions carried out in a given building with respect to three requirements, as follows: First, the activities requiring full inclosure and heat; second, the activities requiring protec-

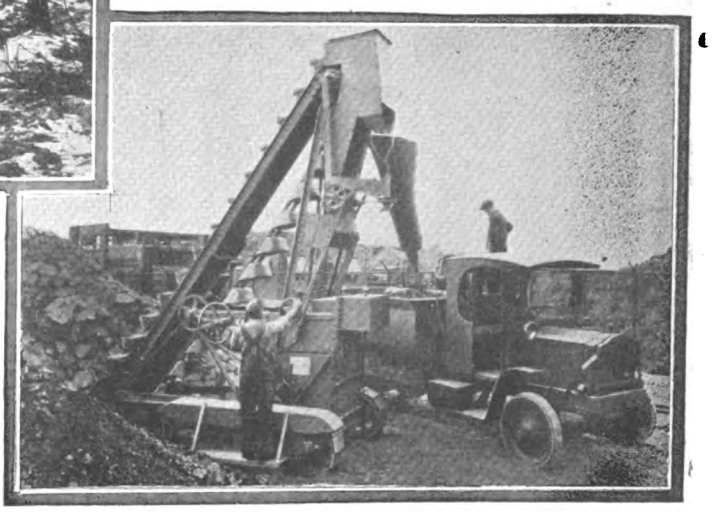
(*Continued on page 63*)



There is always opportunity to make new land around the big manufacturing plant. This overhead system does it as part of the day's work.



The crab bucket operated by this locomotive crane picks up huge bites of scrap iron, thus giving the lifting magnet "a run for its money."



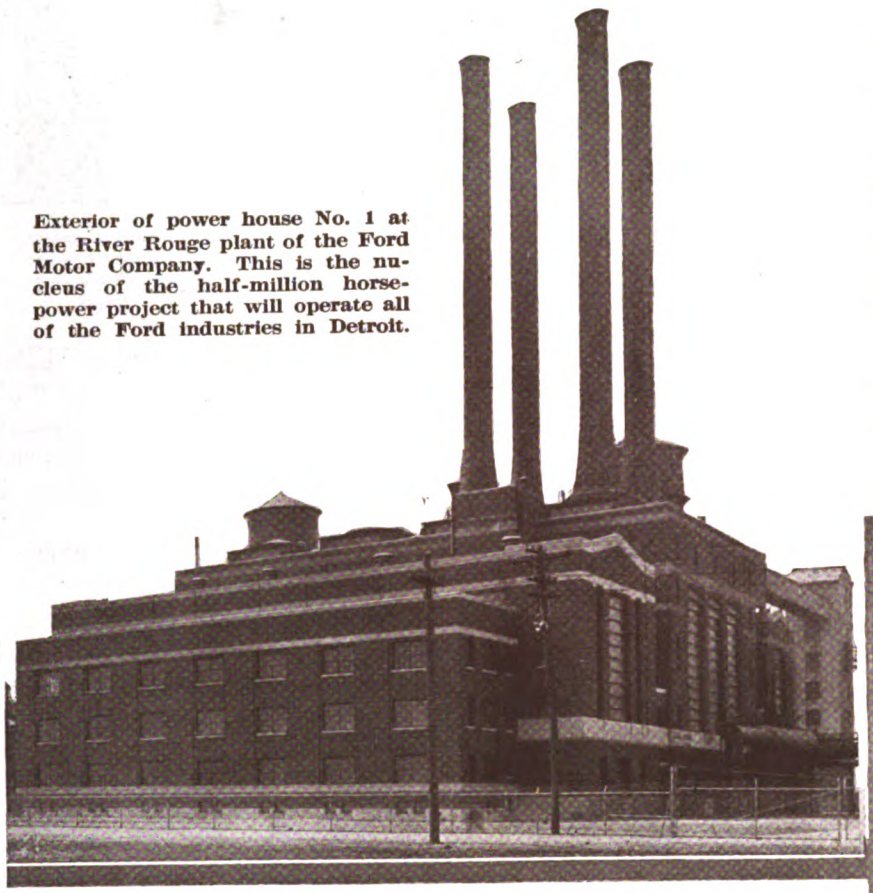
The motor truck has a place in hauling coal from storage but for most efficient service must be served by a coal loader.

Digitized by Google

Power Generation at River Rouge

Converting Waste into Kilowatts at Ford's Newest Plant

BY JOHN H. VAN DEVENTER



Exterior of power house No. 1 at the River Rouge plant of the Ford Motor Company. This is the nucleus of the half-million horsepower project that will operate all of the Ford industries in Detroit.

IN spite of the ninety thousand men who are daily employed by the Ford industries in Detroit, power is the invisible workman who does most of the physical labor in the making of Ford car or Fordson tractor. From the ore and coal pile in the huge concrete bins back of the High Line at River Rouge to the shipping door at Highland Park, where the freight cars emerge with finished product, *power* does all the hard work of pulling and pushing, lifting and hauling, picking up and setting down, boring and turning, sewing and stitching, planing and polishing—in fact power, under man's supervision, creates the five thousand cars and the five hundred tractors that comprise the present time daily Ford output.

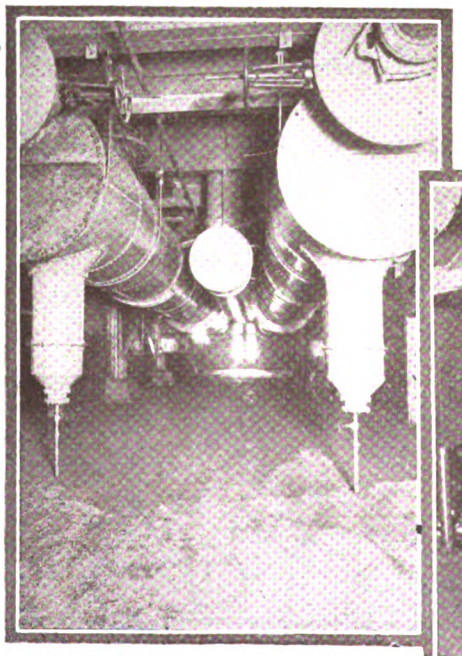


Seventy per cent of the fuel used for power is waste gas from the blast furnaces which comes to the power house through the huge mains shown above.

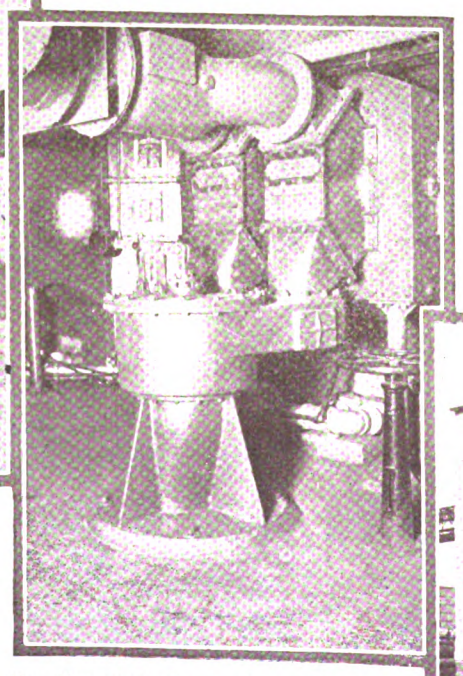
One who has followed the preceding pictorial articles in this magazine* which have illustrated other departments of the highly interesting River Rouge plant at Dearborn, Mich., will have noted the many unusual ways in which wastes are being turned into profits. Nowhere is this more true than in the huge "power plant No. 1," the great red brick and structural steel building from the roof of which giant stacks rise to a height of 320 feet, a building which houses the 30,000 kw. nucleus of what is soon to be a quarter-million horsepower plant. For when the new construction now under way is completed, this *power* plant at River Rouge will operate all the Ford industries at Detroit, including Highland Park.

The exterior of this power plant is shown in the first picture accompanying this article. The building which extends some 350 feet from east to west 250 feet to north and south is divided into a number of rooms by vertical partitions or walls. These rooms are large enough to be buildings themselves and are actually

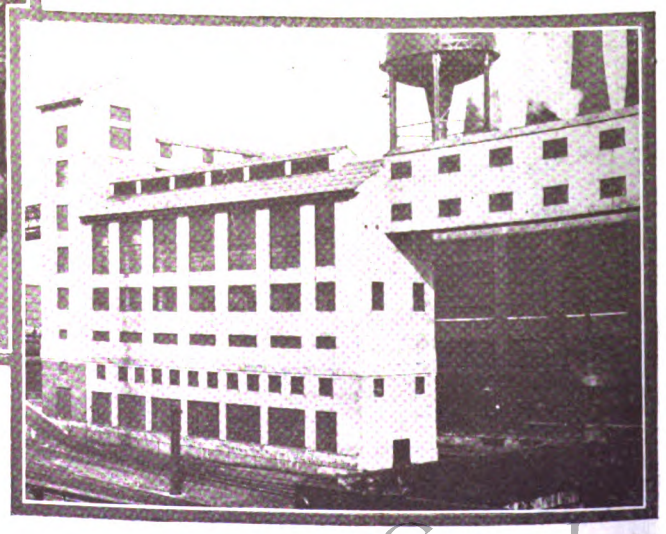
* See Industry Illustrated, November, 1922, and January, 1923



Above is a view showing the blast furnace gas mains as they enter the ground floor of the boiler room under the huge water tube boilers.

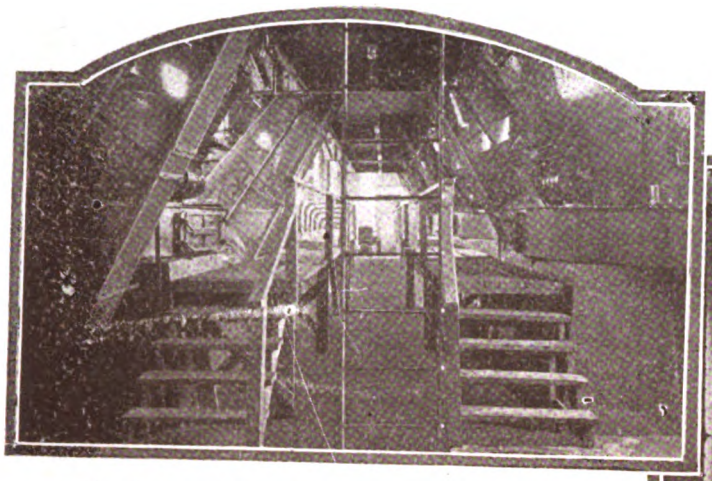


On the next floor above are the gas "burners" or mixers where gas is introduced into the combustion chambers through "Dutch ovens."



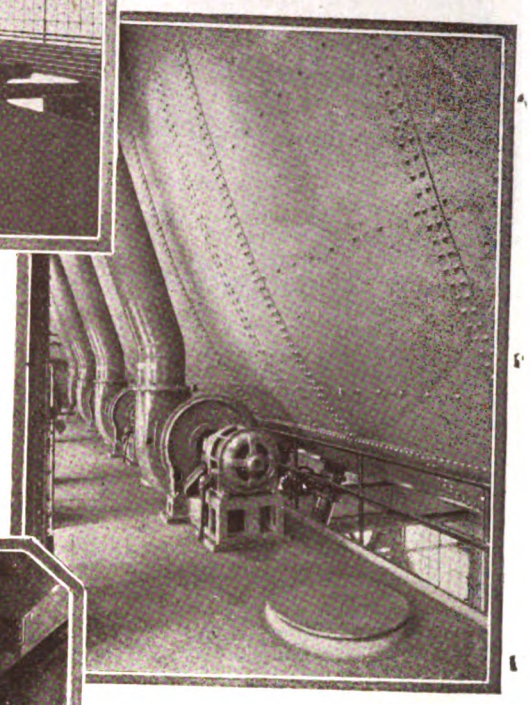
The remainder of the fuel requirements is normally cared for by powdered coal. This is a view of the pulverizer building which is connected to the power house by an overhead conveyor gallery.

Digitized by Google



On the ground floor of the pulverizer building are two batteries of pulverizing mills which reduce nut and slack to extremely fine powder.





A system of cross conveyors distribute the raw coal to the bunker and the finished powdered coal to bucket flight elevators.

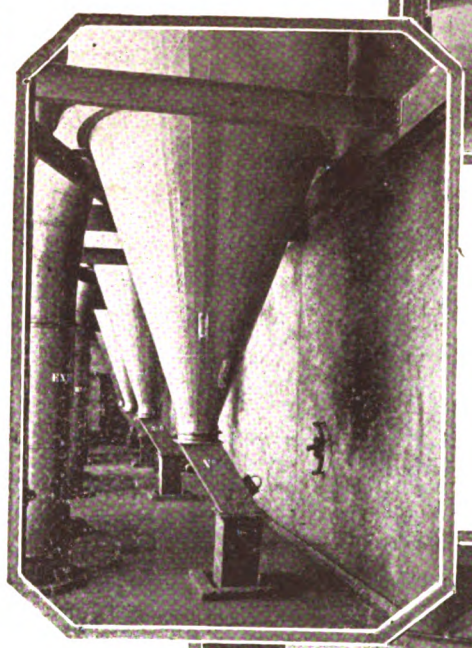
called "houses" in the plant parlance.

For example, at the extreme left in the picture is the "blower houses" in which huge multi-stage turbine driven centrifugal blowers provide air blast for the blast furnaces. Next to this is the boiler house containing at present four enormous water tube boilers rated at 2647 normal horsepower each. Three of these boilers are in operation at one time at present, working under an average rating of 250 per cent. Four more of them are now being installed, the work being well under way, for it must be kept in mind that there is nothing stationary about any part of the Ford industrial projects—they grow continuously and the power plant must not only keep pace with this growth but be, at all times, one step in advance of it.

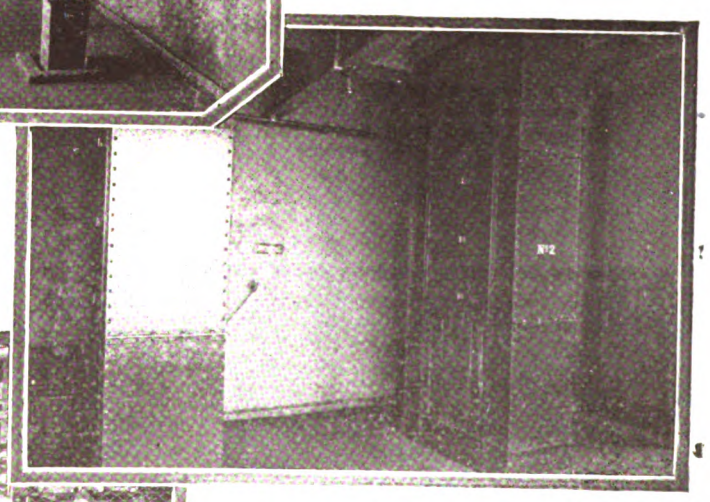
At the right of the "boiler house" is the "generator house." This is divided into two floors, the upper containing the turbine driven generators and the lower being in the nature of a condenser pit for the surface condensers and their auxiliary equipment which serve the huge turbines.

At the right of the generator house is the switch house which contains the electrical control and distribution system. This is divided into several floors on which are located switch room, reactor room, battery room, etc. This completes roughly the general description of power house arrangements.

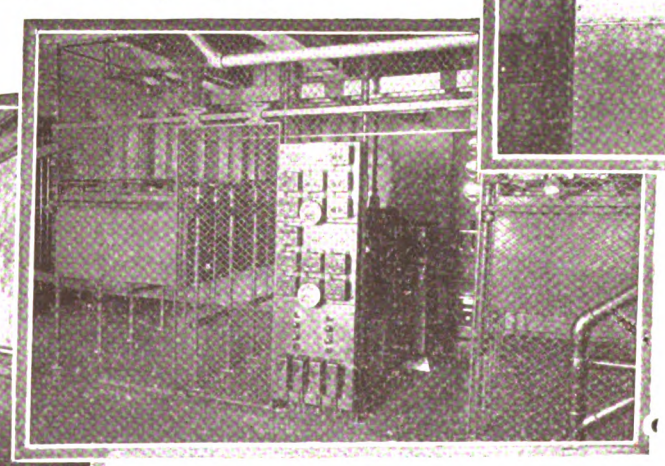
Any power plant may be regarded as a factory whose product is steam or electrical horsepower. A plant of this sort operates upon raw materials, the two principal ones being *fuel* and *water*. The by-products produced by such a plant are represented in the exhaust steam with its contents of valuable heat units. The efficiency of a plant of this sort does not depend merely upon how many pounds of fuel it requires to produce a certain number of steam or electrical horsepower. That is the small end of the problem.



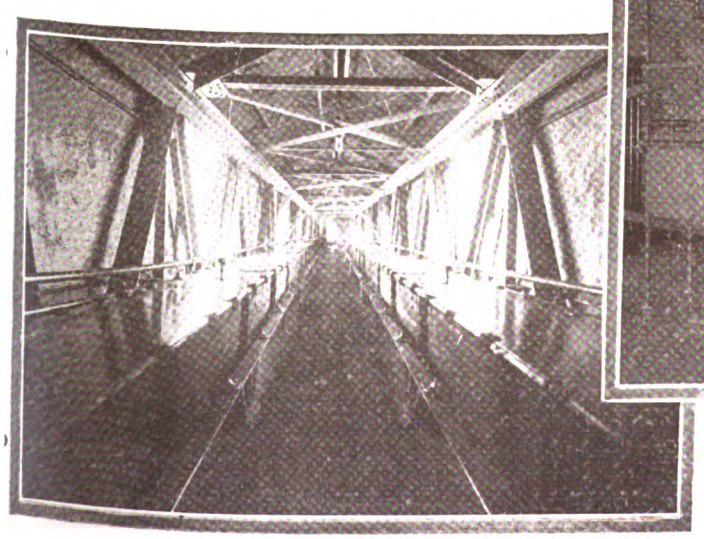
Above is a view of the 700-ton capacity raw coal bunker, from which the pulverizers are fed. The fans exhaust air from the pulverizers and deliver the powdered coal to cyclone separators shown at the left.



After the coal has been freed from the air it is carried by bucket flight elevators shown above to the top of the pulverizer building.

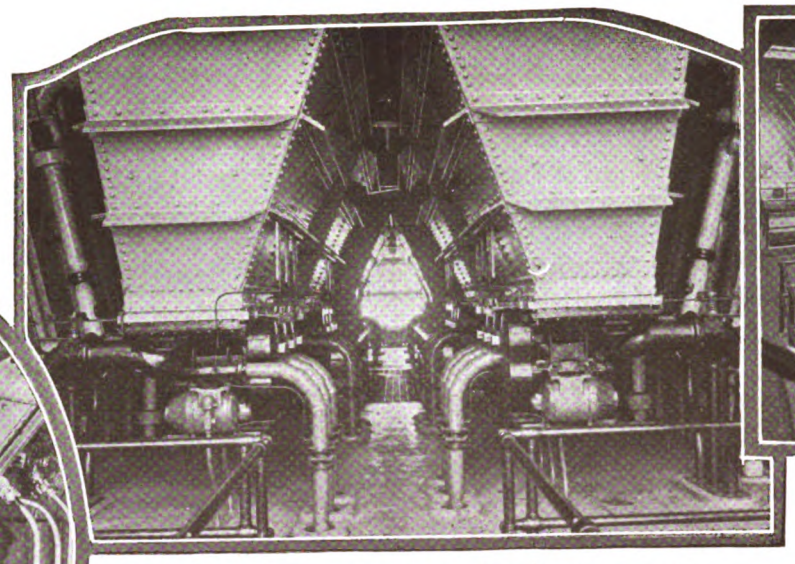


All of the conveyors and apparatus in the pulverizer building are under centralized push button control from the control room shown at the left.



At the left is a view of the conveyor gallery showing the two 16-inch spiral conveyors which carry the powdered coal across to the power house.

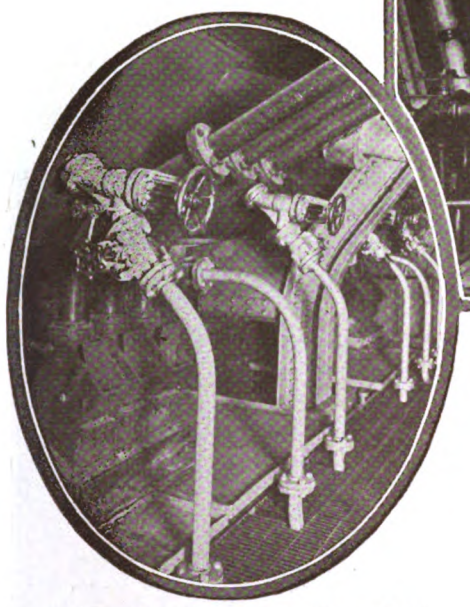
Digitized by Google



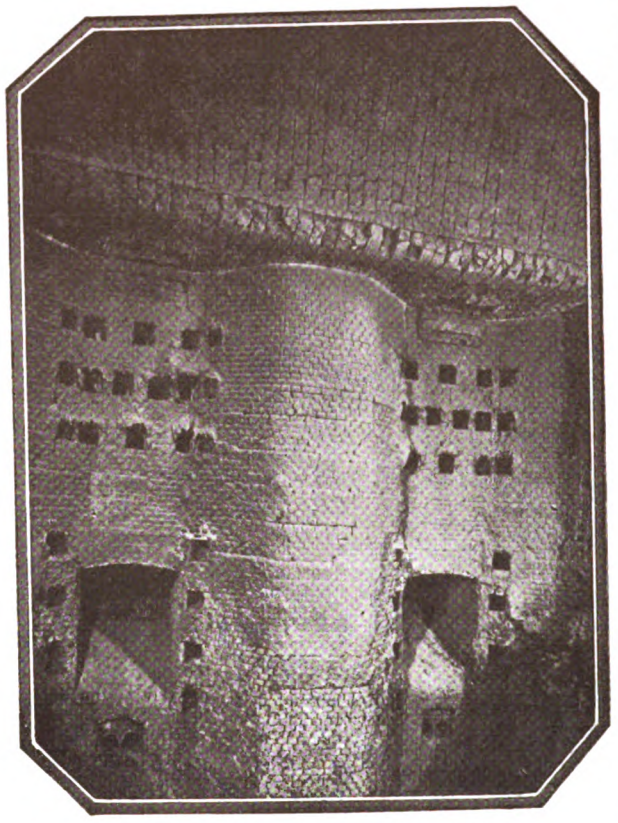
Pulverized coal is stored in bunkers near the top of the boilers and is fed at any desired rate by means of coarse pitch feeding screws operated by variable speed motors.



Spiral conveyors deliver the coal to the boiler bunkers, it first being automatically weighed by means of the scale shown in this picture.



After leaving the mixers the pulverized coal enters the furnace combustion chamber through burners shown above.



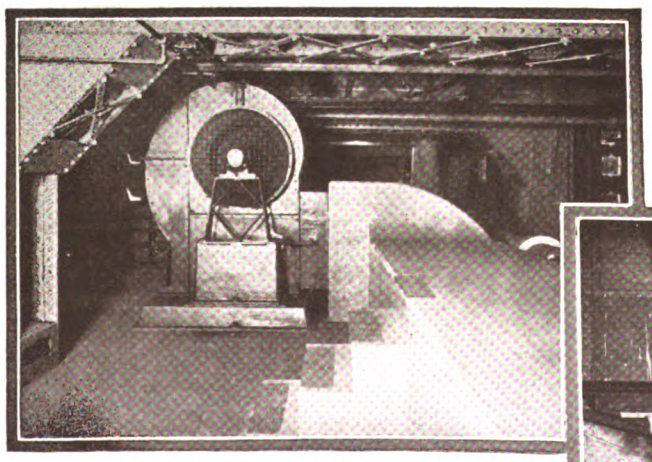
This is not a picture of Aztec cliff dwelling but the interior of one of the huge combustion chambers of the boilers at River Rouge.



Ninety per cent of the air for combustion is admitted to the boilers by induction through hinged inlet doors such as shown in this picture.

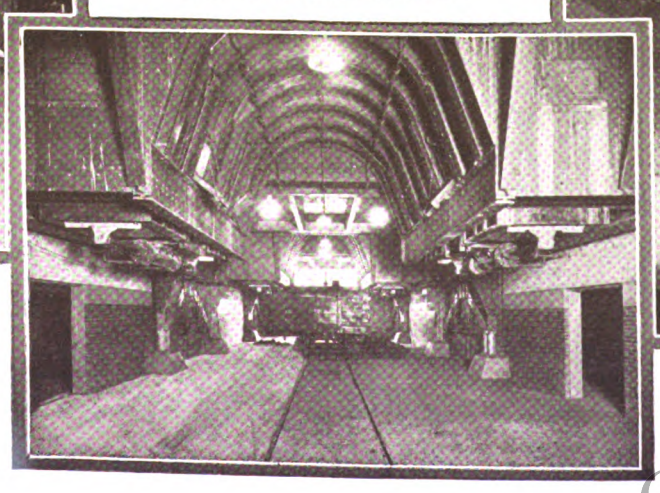
The big considerations in the case of a plant such as River Rouge are entirely different. The first consideration is continuity of operation—absence of shutdowns, even momentary ones, which would aggregate thousands of dollars in production penalties. The second consideration is the cost of the fuel. The average plant has little choice in this matter, having to pay what the coal dealer asks.

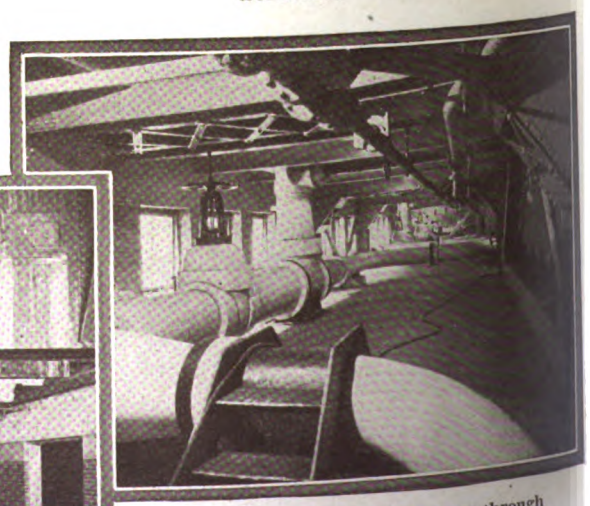
At River Rouge, however, the coal dealer plays but a small part. Seventy per cent of the fuel burned at River Rouge for producing power is waste gas which comes from the stacks of the blast furnaces. The remaining thirty per cent is made up of powdered coal. This fuel takes care of the fluctuations in rate combustion occasioned by varying the load, the flow of gas being practically constant, and all of the waste gas being burned. Provisions are also made to burn the coal tar and illuminating gas produced as by-products of the Ford coke ovens, if the emergency should demand. Means are also pro-



Motor-driven blowers, such as are shown here, furnish air to the powdered coal mixers shown at the top of this page.

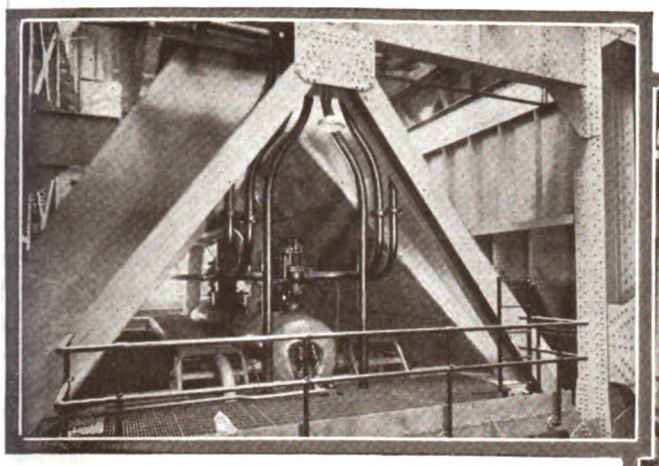
Below are the ash pit gates beneath one of the boilers. These discharge directly into freight cars on a track beneath.



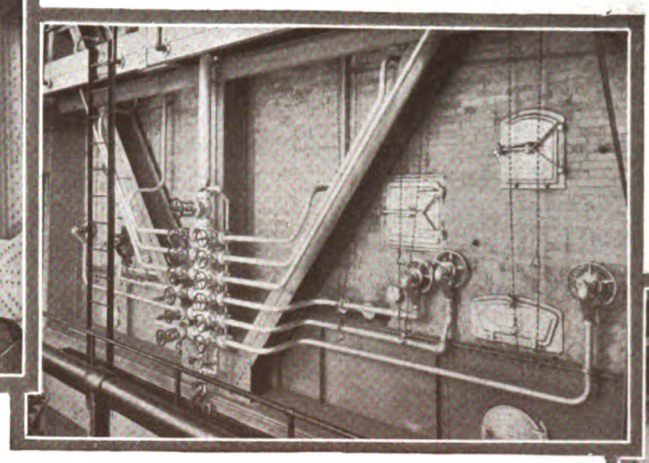


Steam from the boilers comes through vertical mains to a continuous header from which it is distributed.

Digitized by Google

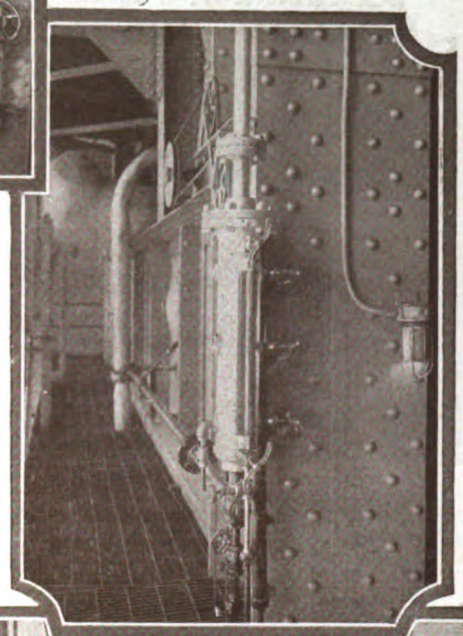


At the top of each boiler is a steam collecting drum which frees steam from entrained water before it goes to the superheater.



Each boiler is fitted with a complete equipment of soot blowing apparatus. This is shown above and is available from one of the mezzanine boiler galleries.

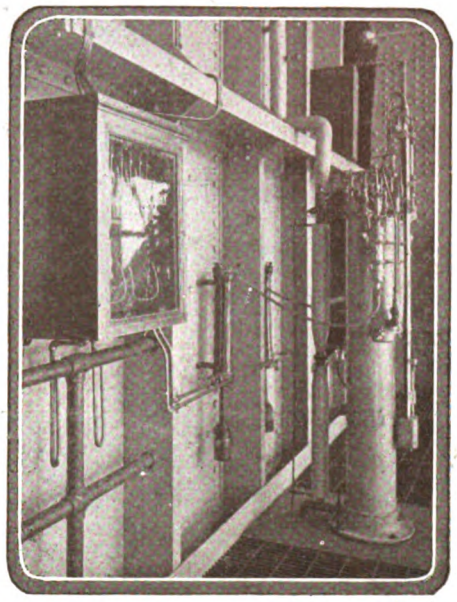
Another mezzanine gallery gives access to the safety water column and to the top steam drums when scaling is necessary.



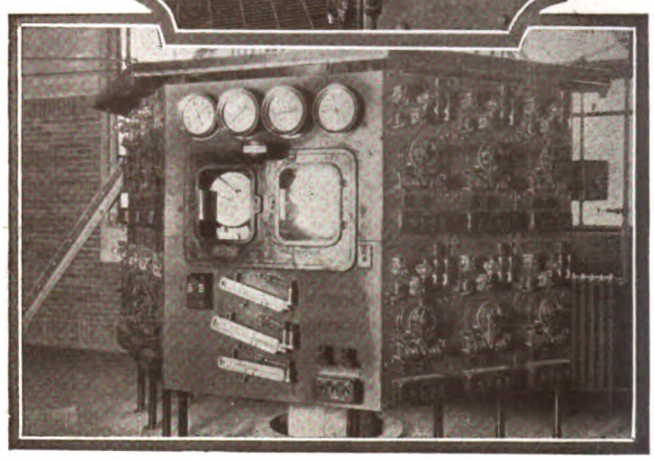
vided for burning fuel oil. It was by the use of these alternatives that the power plant was enabled to keep going during the recent coal shortage when operations would otherwise have had to have been curtailed.

Normally, however, this plant burns blast furnace gas and powdered coal. The gas is conducted to the power house from the blast furnace units by means of huge, riveted, steel-plate mains, the gas flowing under blast furnace pressure, being in fact pumped by the turbo-blowers. Sixty-seven million cubic feet of this gas is burned every twenty-four hours. It is fed to the huge furnaces or combustion chambers of the boilers through "Dutch ovens," located near the ash pits. There are four of these mixing ovens for each furnace, each one surmounted by a mixing valve which permits the inflow of gas to carry with it, by induction, a sufficient amount of air for its combustion.

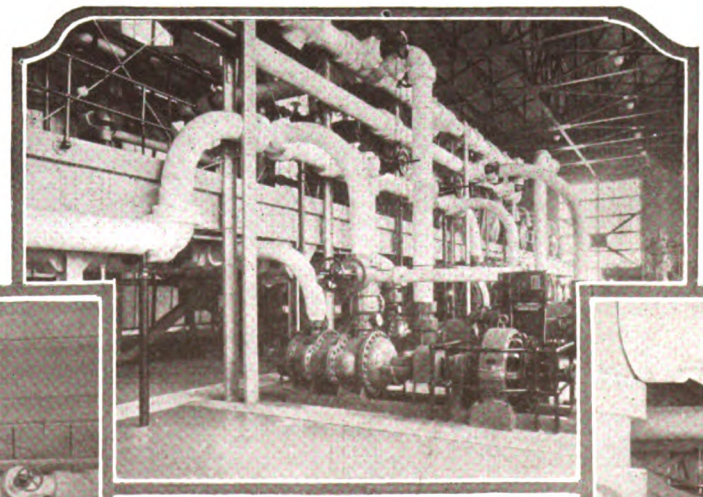
Approximately 250 tons of powdered coal are burned daily at River Rouge in addition to the blast furnace gas in



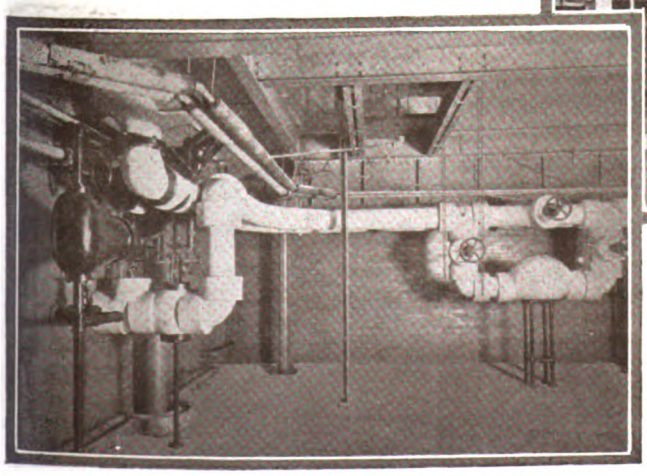
Automatic analyses of the flue gases are made at frequent intervals to determine the CO_2 content.



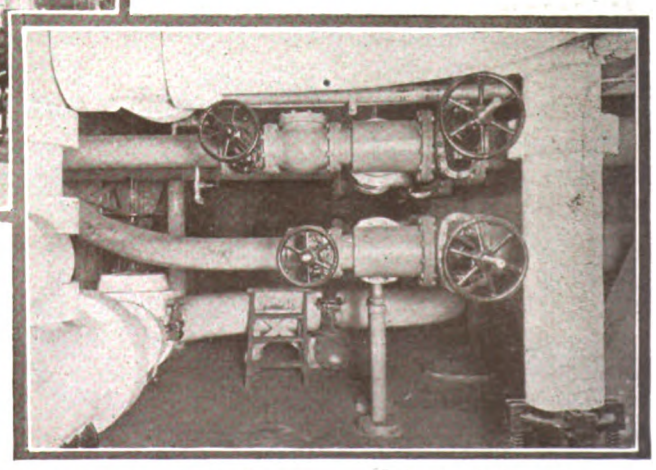
A control board is provided for each boiler with gages, recording instruments and push button control for all regulations.



Nothing but pure distilled water is allowed to enter the boilers at this plant. Above is a view of the evaporator room where the feed water make up is distilled.

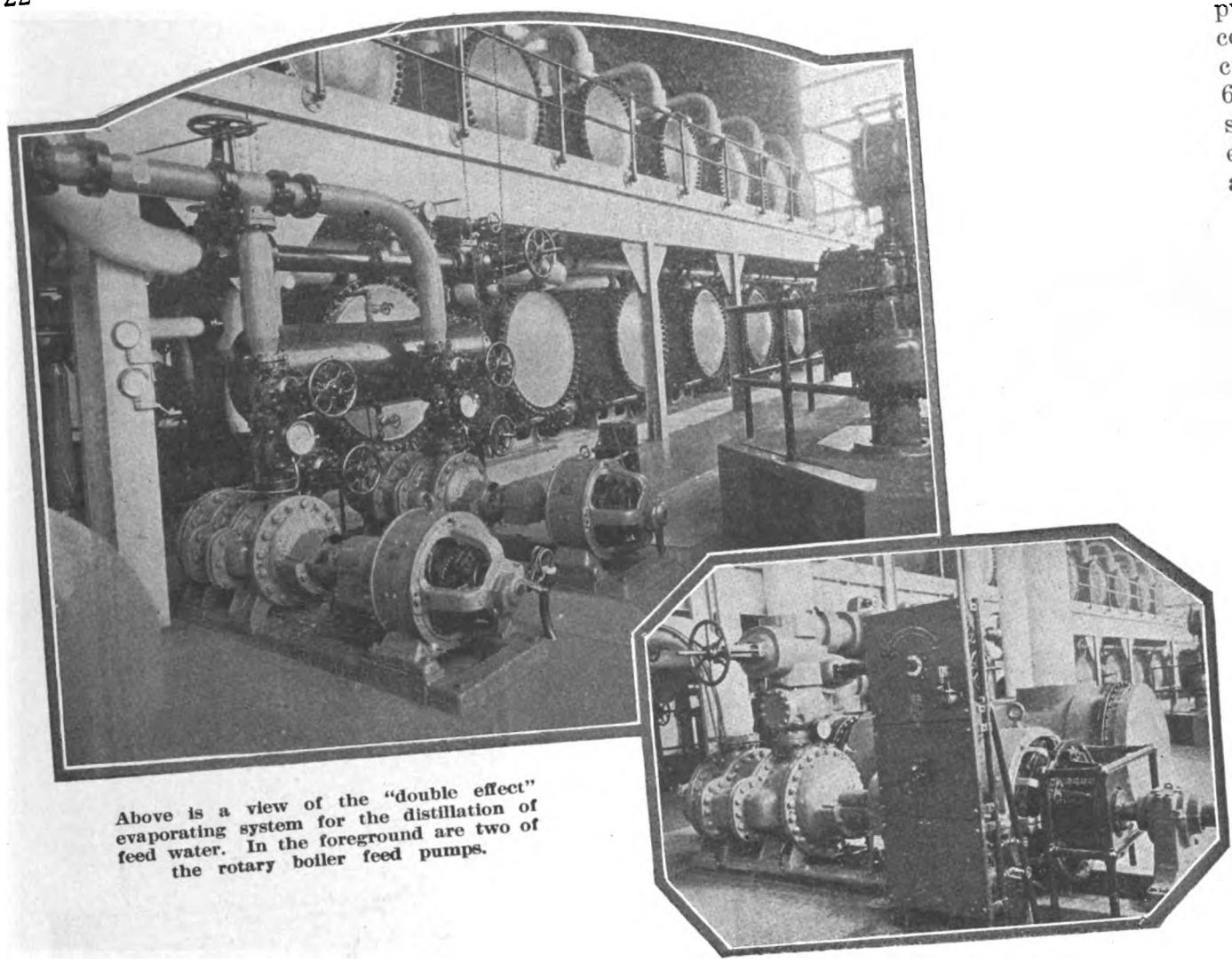


Condensate from the turbines, heating system, etc., goes to a hot well at the left of this picture. City water mains are provided for emergencies.



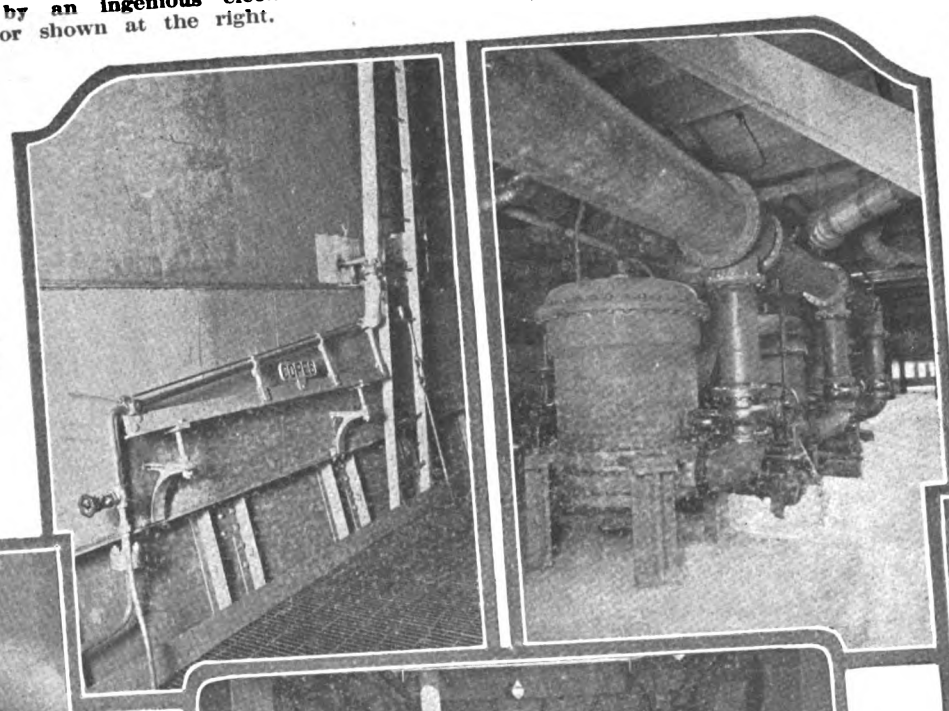
A view of one corner of the "pipe gallery" showing steam headers and condensate return lines leading to the hot well.

Digitized by Google

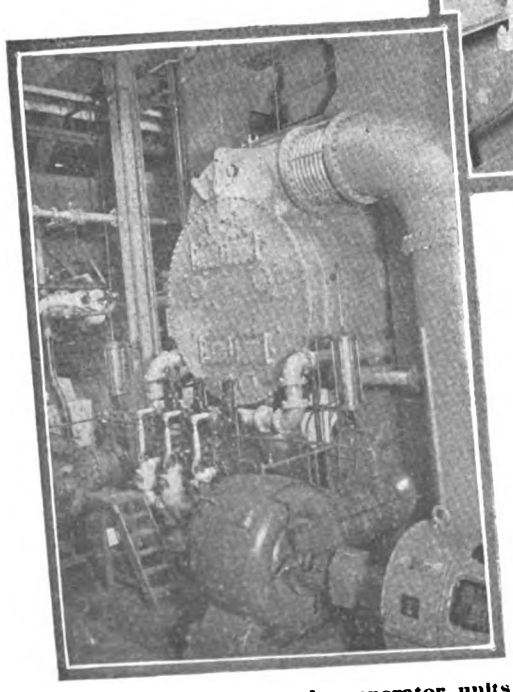


Above is a view of the "double effect" evaporating system for the distillation of feed water. In the foreground are two of the rotary boiler feed pumps.

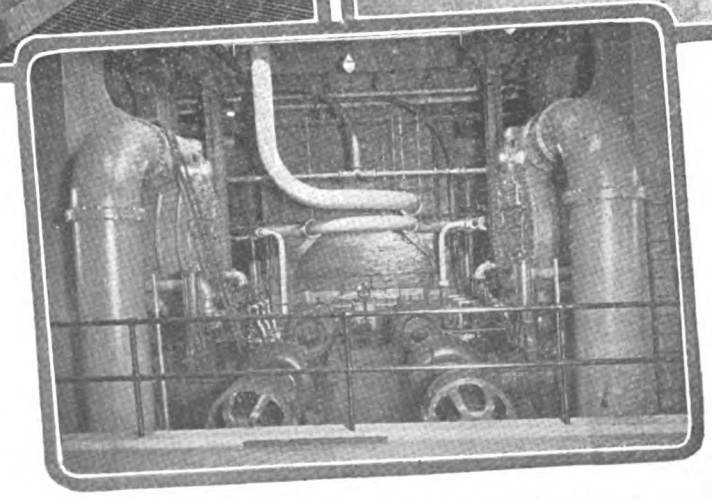
The load on these pumps is divided and controlled by an ingenious electrical regulator shown at the right.



Feed water is admitted to the boiler at each end of each lower drum and is automatically regulated by the apparatus shown at the right.



Beneath the main turbo-generator units are surface condensers which maintain an average vacuum of 28½ inches.



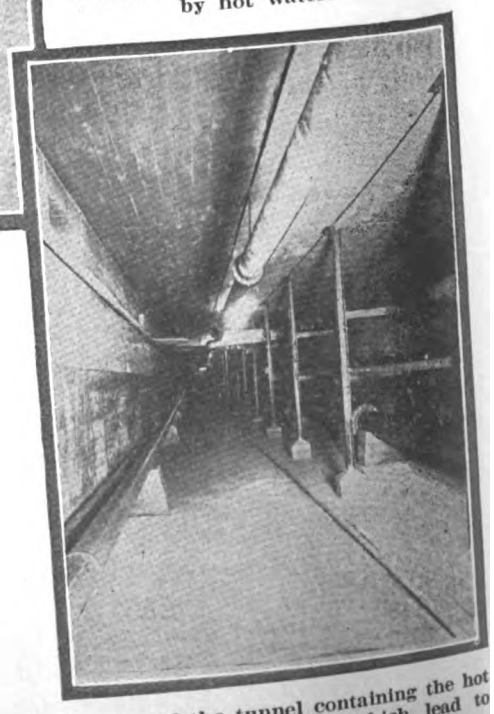
A general view of the condenser pit is shown above. In the center background is the oil purifying and circulating system serving the main units.

the three boilers which are now kept in operation. The pulverizer building where this coal is pulverized is a steel-concrete structure, 200 feet long, 60 feet wide and 118 feet high, standing adjacent to the power house and attached to it by an overhead conveyor gallery.

On the ground floor of the pulverizer building are the grinding mills in which the coal is ground from nut and slack sizes so that eighty-two per cent of it will pass a 200-mesh screen. This operation is carried on in a *partial* vacuum, produced by fan exhausters which are connected with the grinding mills and which not only assure dustless operation but which also serve as the means of transportation of the finished pulverized powder from the mills to the separators on a floor above. For as soon as coal has reached its required fineness in the mill it is whirled away by this air suction and carried to cyclone separators.

The complete separation of air from powdered coal is necessary to prevent spontaneous combustion in its storage bunkers. Therefore after the coal has left the cyclones it is deprived of the remainder of its air content by being passed through long tubular cloth bag separators. Then the powdered coal is carried by bucket flight elevators to a system of spiral conveyors which lead across the gallery

At the left is a view of the newly installed system of heaters used in connection with heating of plant departments by hot water.



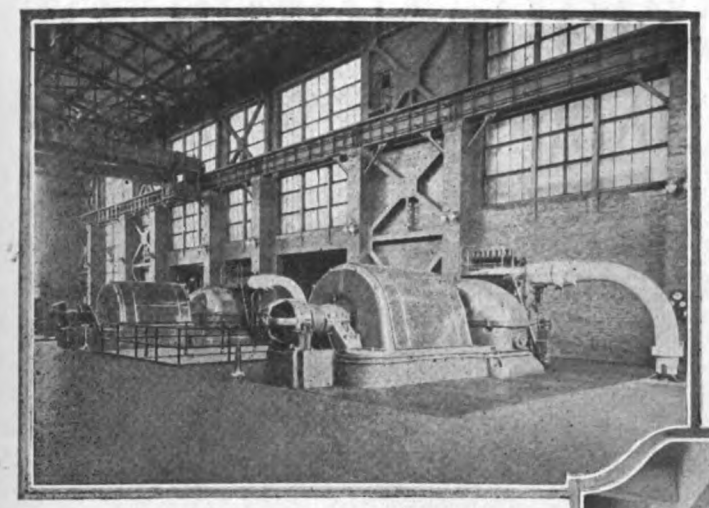
A view of the tunnel containing the hot water circulating pipes which lead to and heat the huge Rouge foundry.



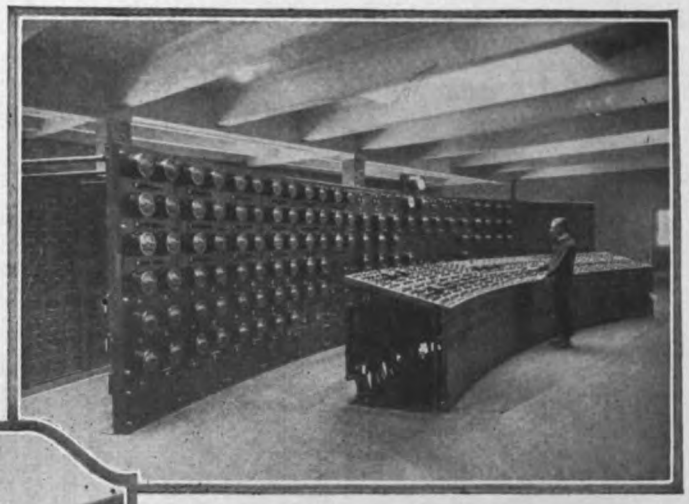
The two
now insta
the huge

previou
finally
coal bu
to the
The
to the
pendi
This
made
genio
by va
of th
vide
spee
late
by
trol
els
late
ser
po
st
is
th
o
n

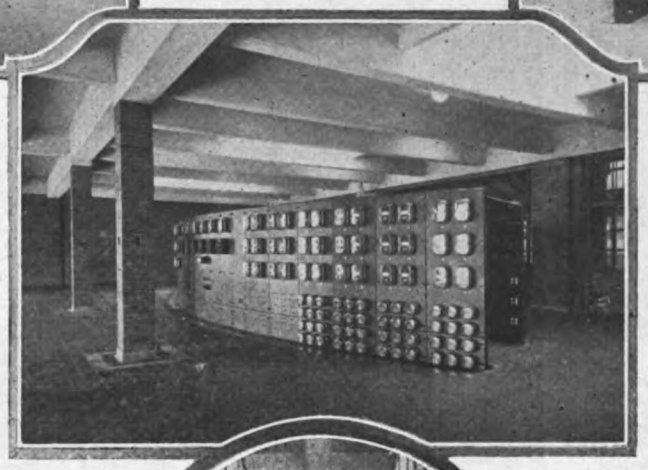
Digitized by Google



The two 12,500 kw. turbo-alternators now installed are but a beginning for the huge 500,000 horsepower project under way.



The electrical load is controlled and distributed by means of push buttons and signal lights from the panel in the control room shown above.



To avoid danger and fire risk the 4600 volt switches, bus bars, etc., are housed in insulated cabinets through which cooled, dehumidified air is circulated.

previously mentioned, being finally deposited in powdered coal bunkers ready to be fed to the boilers as fuel.

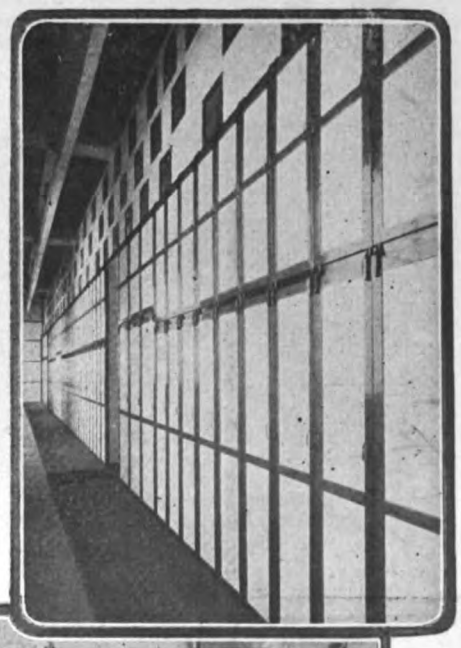
The pulverized coal is fed to the boilers at a rate depending upon their needs. This variation in feeding is made possible by means of ingenious screw feeders driven by variable speed motors, four of these feeders being provided for each boiler. The speed of these motors is regulated from the operating floor by means of push button control on the boiler control panels which will be described later on. After passing the screws of these feeders the powdered coal, met by a stream of air under pressure, is conducted to burners through which it falls into the combustion chamber, being admitted near the top of this and immediately over the Dutch ovens which admit the blast furnace gas. Thus the heavy coal-laden stream of air falling from each burner quickly becomes ignited and adds its efforts in B. t. u.'s to the total heat score.

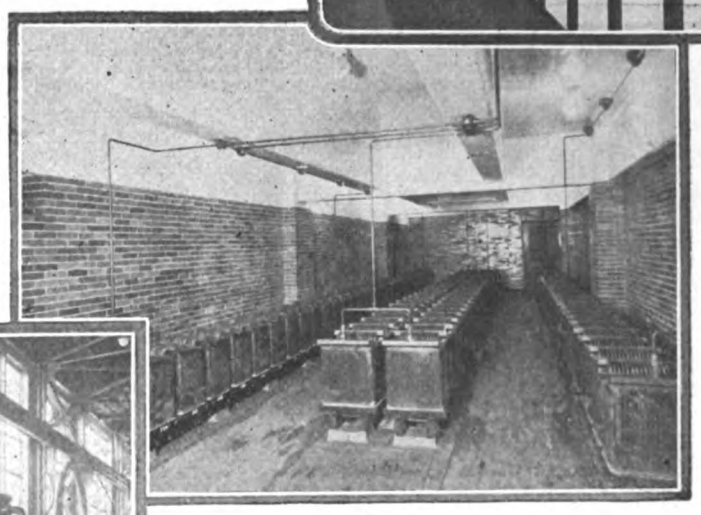
The boilers at River Rouge are among the largest high pressure boilers in existence. Their total height from ash pit floor to the top of superheater piping is close to 83 feet. They are of the five drum type, having four steam and water drums and one top drum for collecting steam before it goes to the superheater. The furnaces of these boilers are in size approximately twenty-four feet square and fifty-five feet high. Each boiler with its superheater and setting, as well as its brick lined, eleven-foot diameter

(*Continued on page 56*)

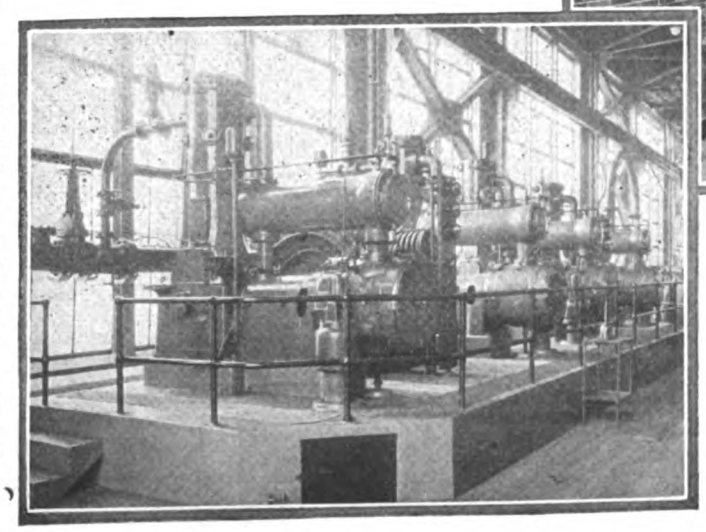


A view in the switch room. The inclosed switches are operated from the control room, being actuated by push buttons.





Above is the storage battery room which provides current for operating the control board and also for emergency lighting in case of breakdown.



Compressed air for plant use is provided by the compressor unit shown in the picture at the left.

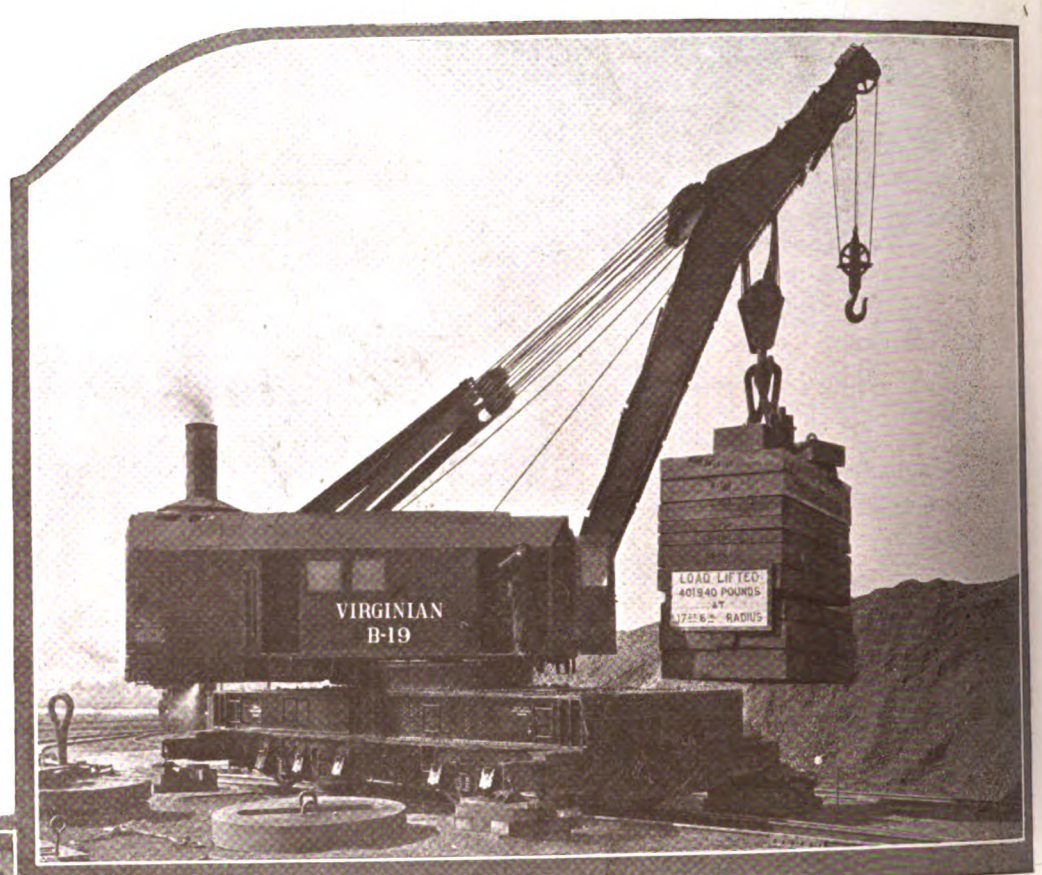
Digitized by Google

Pictorial News of

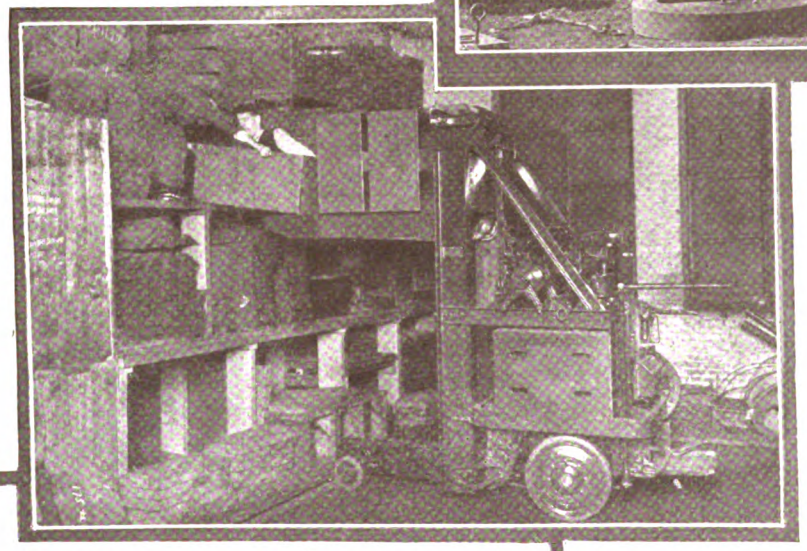
Recent Developments in



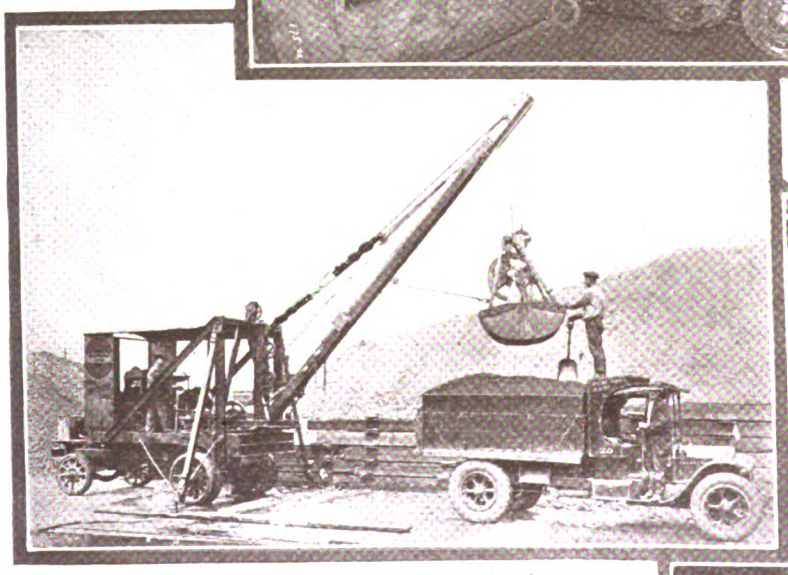
This apron and hood was developed to meet the needs of sand-blast operatives. The increasing use of steel shot as an abrasive called for better protection of the workers, and these "shot-proof" garments are now available for the purpose.



This is said to be the largest railroad wrecking-crane ever built. In use by the Virginian Railway Company, it has a capacity of 400,000 lbs. at a 17½ ft. radius. The main problem in its design was to keep within railroad clearances and axle loads, and yet obtain this immense capacity.



A well-known manufacturer of industrial trucks and tractors has recently added to its line the unit shown on the left. This truck is capable of lifting a two-ton load to a point 6 feet from the floor level, by cable-hoist mechanism, electrically operated.



A crane especially designed for mounting on a motor truck, is now available. The crane alone weighs only six tons. It is furnished with a 30-horsepower gasolene engine, and can be used for a variety of work where locomotive cranes would be too bulky or expensive to operate.

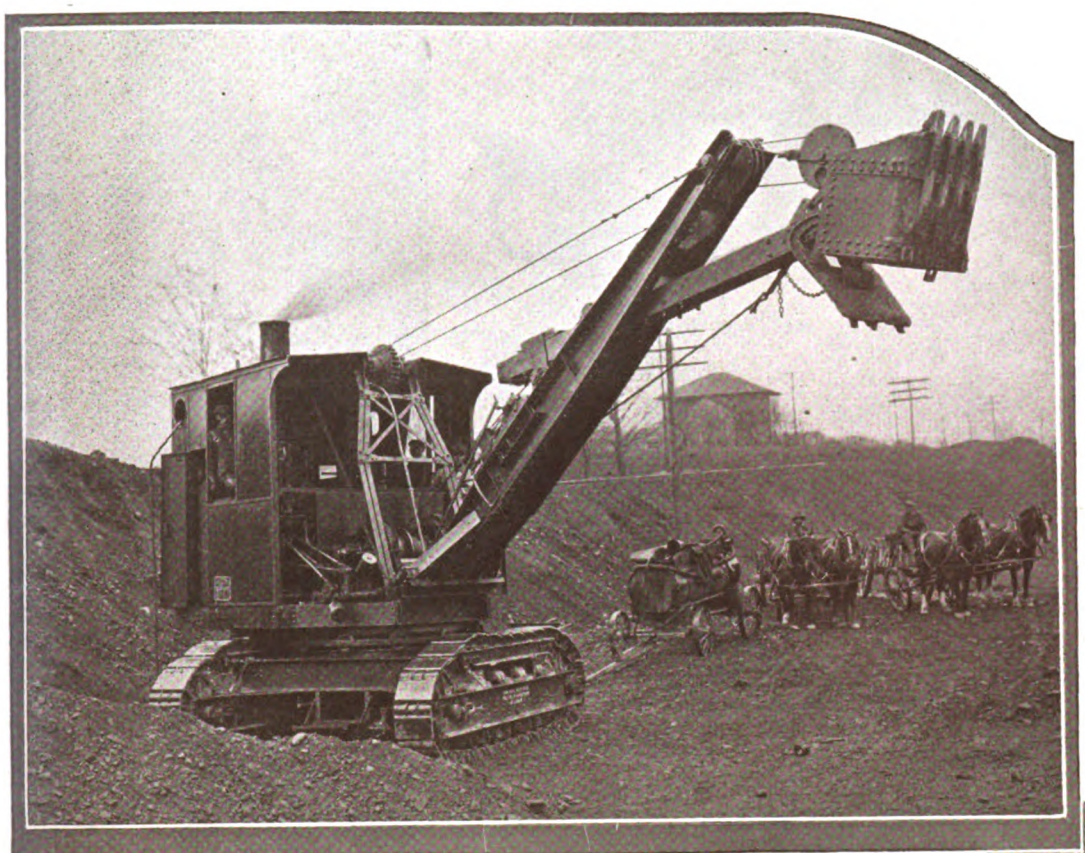


This bench type sanding and polishing machine is equipped with a one-third horsepower motor and weighs approximately fifty pounds. It is especially adapted to sandpapering tables, benches, etc., and to polishing or scrubbing such surfaces.

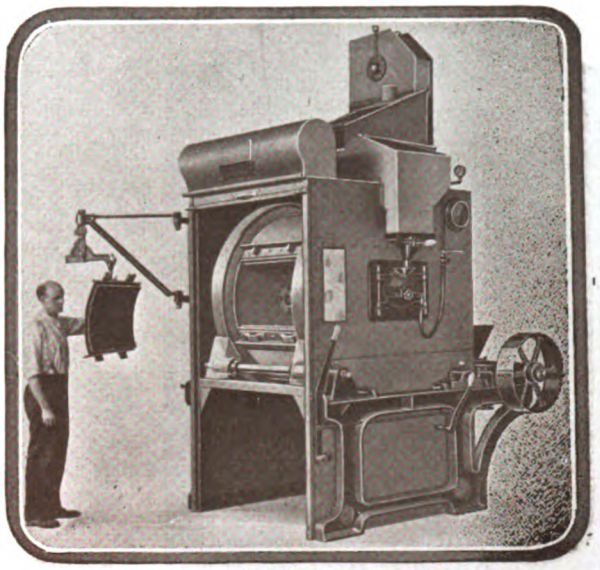
Digitized by Google

the Machinery World

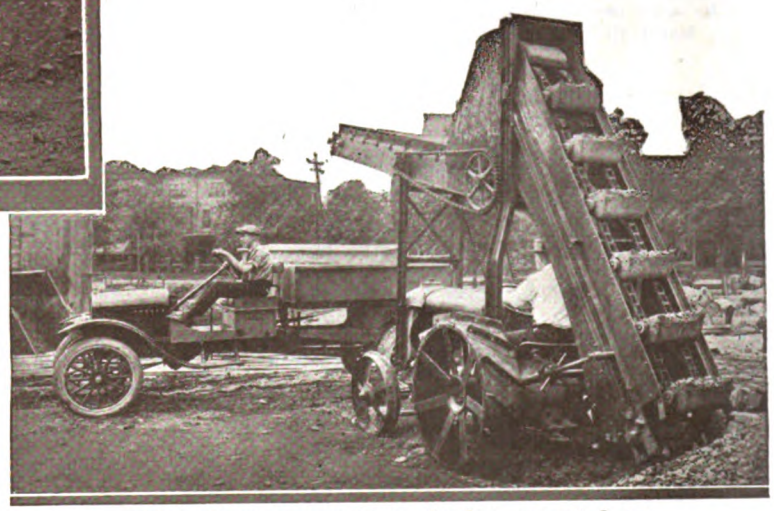
Labor-Saving Equipment



This combination crane and shovel combines the advantages of both in one unit. The crawling tread makes for mobility, while only a minimum of time is required to substitute shovel boom and dipper for ordinary crane boom. The radius of the boom may be varied; enabling the shovel to dig several feet below normal operating level, and also increasing the lift.

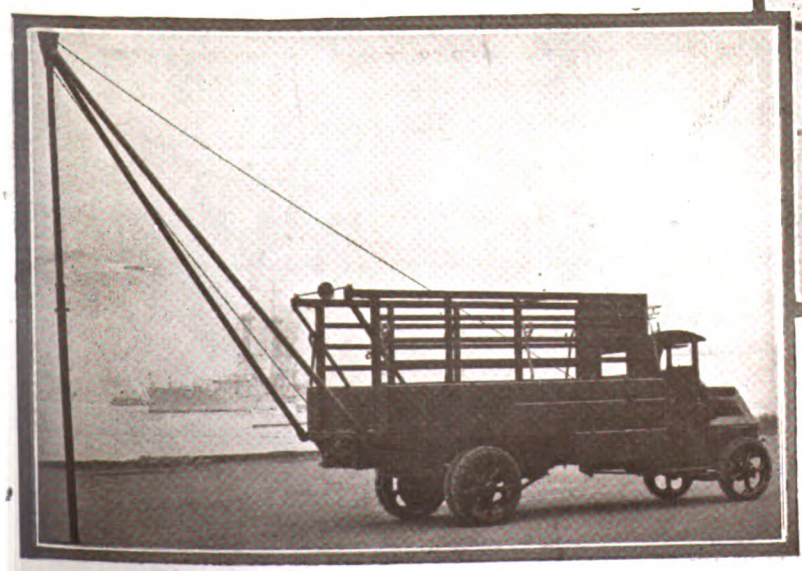


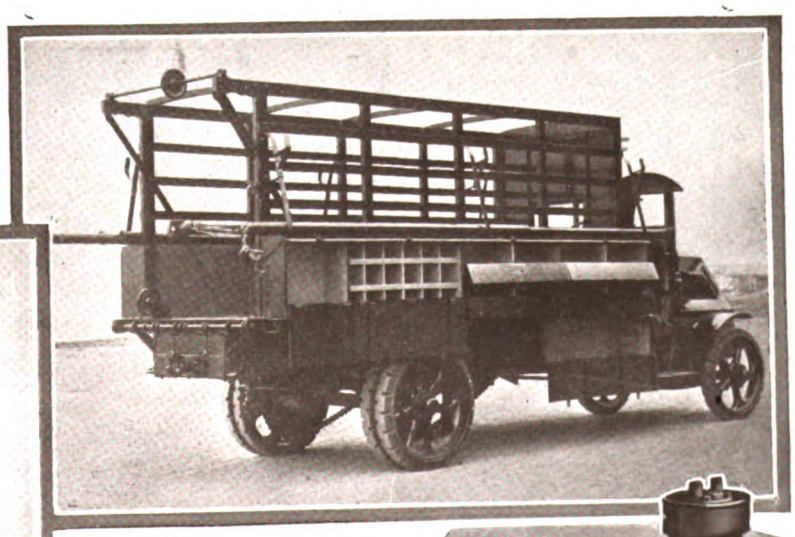
Above is a new sand-blast barrel, in which the nozzles are adjustable both vertically and horizontally; making for more economical operation on a wide variety of work.



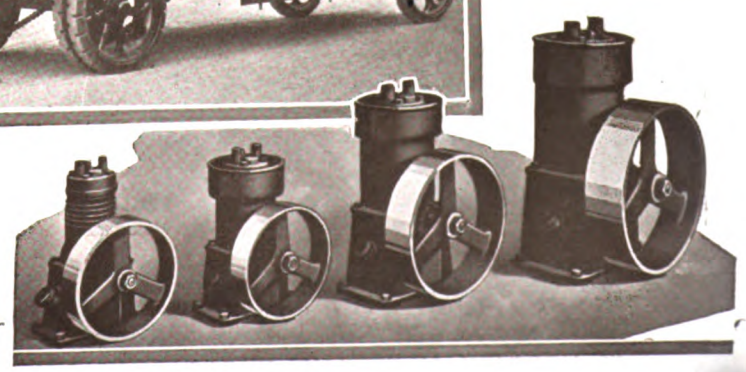
The above power-driven loader, mounted on a well-known make of tractor, furnishes a unit of wide usefulness. The loader is operated from the power shaft of the tractor, by endless chain.

Below and at the right are two views of the line department truck of the Flatbush Gas Company, Brooklyn, N. Y. Note the compact mounting of the rig for pole setting and cable pulling.





Below are four examples of a new line of vertical air compressors, in which constant level oiling and reliable regulation are features not usually found in small vertical belt-driven machines.

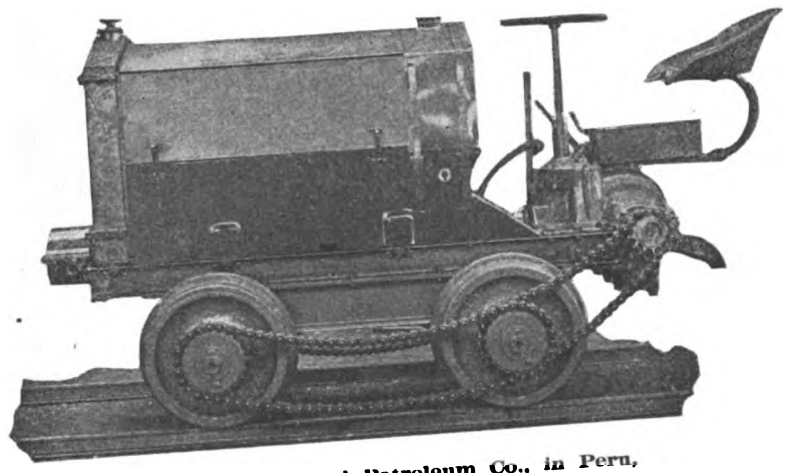


Digitized by Google

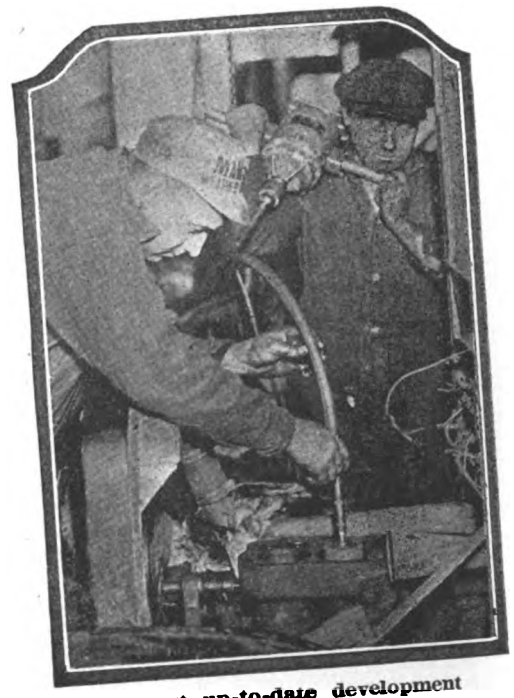
Profit Possibilities Caught by the Camera



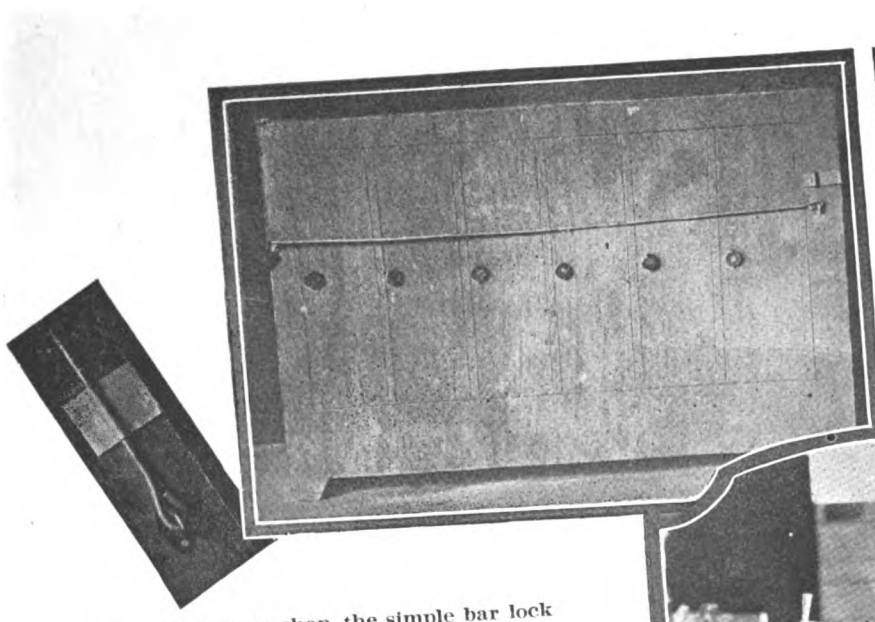
In order to allow dumping coal from this trestle for storage, the coal pile must be continually graded off. This little air hoist, operating scraper drag bucket, and handled by one man, replaces the twelve hand shovelers formerly used.



The International Patroleum Co., in Peru, found that road-building in that mountainous district was too big an undertaking; yet they had to haul their stuff somehow. A narrow gage track, with converted gasoline industrial tractors and trailers, solved the problem nicely.



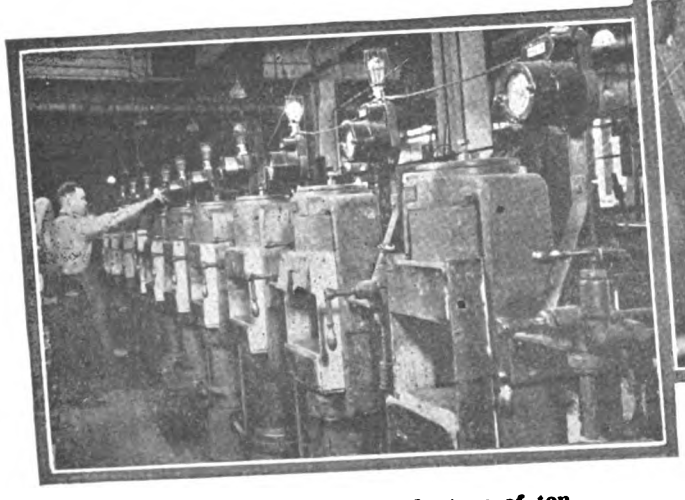
The most up-to-date development of the flexible shaft. Used in conjunction with a portable electric drill, it has been found invaluable in the above Ford Repair Station.



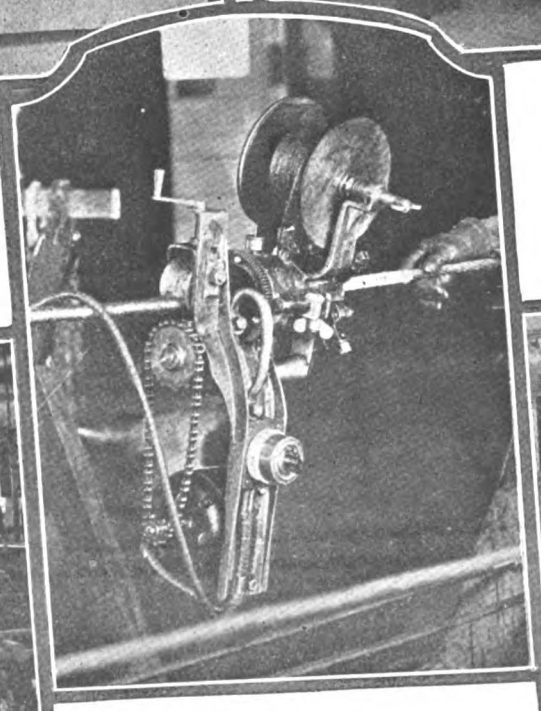
In a small eastern shop, the simple bar lock shown above—which locks all six lockers by means of a single padlock—gave security for the men's belongings at very slight cost.



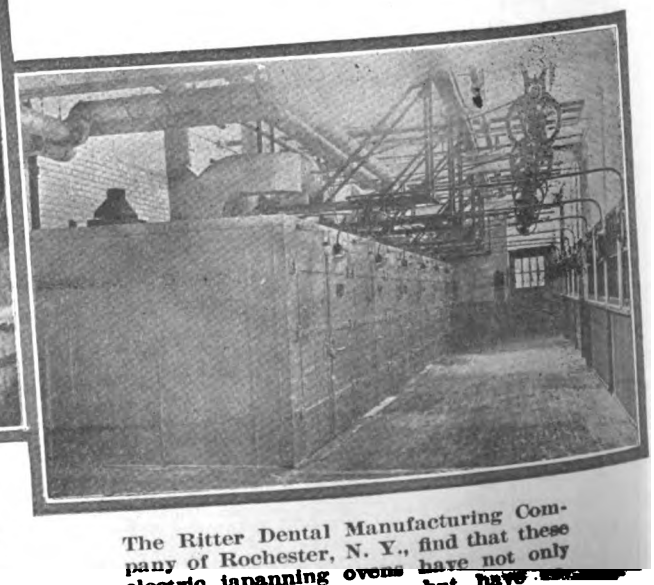
The pay car, shown above, enables the Eastman Kodak Company to pay off its plant in four minutes; quite an achievement, considering the size of the plant, with its thirty-six separate departments.



The above view shows a battery of ten hydraulic presses used in making hot moulded materials, equipped with Process Tinning Indicators. The exact time of completion of operation is automatically signalled to the operator.

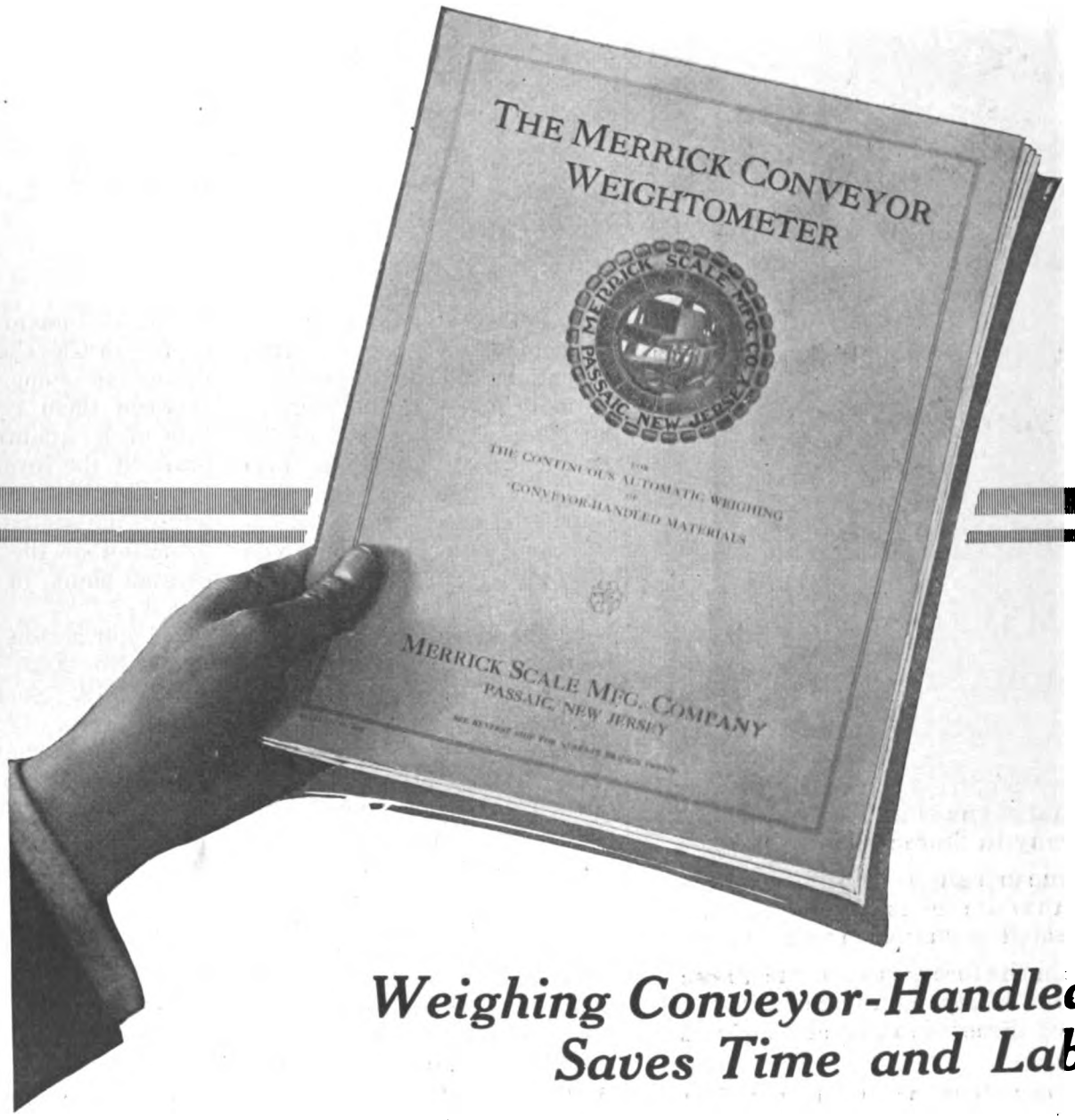


This rope-serving machine, developed by a rigger at one of our Navy Yards, has effected worthwhile savings over the old hand method. It can be operated from a lamp-socket, and in two years use has required no repairs or replacement.



The Ritter Dental Manufacturing Company of Rochester, N. Y., find that these electric japanning ovens have not only speeded up production, but have reduced their percentage of rejections from 20% down to less than 4%.

Digitized by Google



Weighing Conveyor-Handled Material Saves Time and Labor

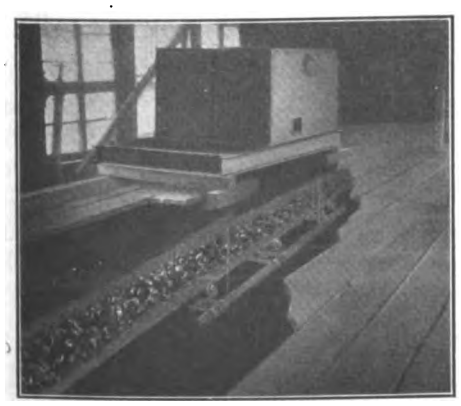
This Circular Shows How

THE MERRICK CONVEYOR WEIGHTOMETER

is designed for use on any size or style of belt, bucket or pan conveyor.

A few of the many commodities handled are Coal, Coke, Stone, Gravel, Cement, Sand, Ore, Salt, Fish, Fertilizer and other bulk material.

A Typical Merrick Weightometer Installation



Every executive should look into the economy of weighing conveyor-handled materials while in transit.

The **MERRICK WAY** makes this a simple operation. The **MERRICK CONVEYOR WEIGHTOMETER** weighs and records the weight of any material while being conveyed over a belt, bucket or pan conveyor, without interrupting the flow and needs no attendant or weightman.

IT IS GUARANTEED AND PROVEN 99% ACCURATE.

It enables you to tell **EXACTLY** how much material you receive instead of depending on Bill of Lading Weights.

This circular explains how hundreds of concerns buy and sell their products by using **MERRICK WEIGHTOMETER** Weights. It will prove to you that Merrick Weights will save time and labor and aid your production.

We will be glad to send a copy to any one interested.

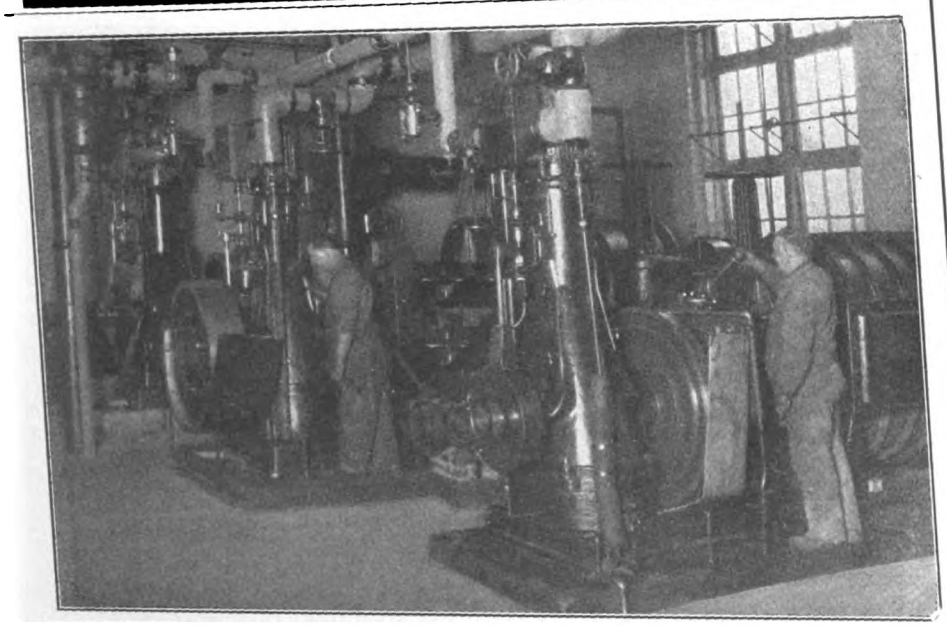
Write for a copy today.

MERRICK SCALE MFG. CO.

180 AUTUMN ST., PASSAIC, N. J.

The Merrick Weigh—Weighs While It Travels

Digitized by Google



TROY ENGINES

....."give very satisfactory service and meet all requirements".....

ANOTHER Troy Engine was recently installed at the plant of the New York and Richmond Gas Company in Staten Island, N. Y.

This is the third one in eight years. The trouble-free service and absolute reliability of the other two Troy Engines led to the recent purchase.

The Troy Engine in the foreground of the above photograph drives a Wilbraham-Green Blower. The other two, are direct connected to Roots Blowers.

Although installed only three months the new Troy Engine is already paying for itself. It is used continually 14 hours out of the 24 and aids the Roots Blower in keeping up its capacity of 300,000 cu. ft. of gas per hour at a maximum pressure of 5 lbs.

The requirements of gas plant service are very exacting. Continuous duty is practically a requisite and the pressures must be maintained constantly.

That Troy Engines maintain a pressure that does not vary from day to day and that they require the least amount of attention is evident in the thousands of Troy installations throughout the gas industry.

Troy Engines are being used for stoker operation, for fans and blowers and for other purposes where compact, rugged small engines are required.

The Troy Catalog explains the many exclusive features such as the self oiling system, the balanced steam-tight valve, etc. Write for a copy.

TROY ENGINE & MACHINE COMPANY

TROY, PENNSYLVANIA

Built in sizes 2 to 200 B.H.P. --
Vertical, Horizontal, Belted and Direct-Connected.

TROY ONLY STEAM ENGINES GOOD ENGINES ONLY ENGINES

Is a Letter a Contract?

BY LESLIE CHILDS

FROM the standpoint of the factory, or other industrial executive, there is probably no more important question of law than that involved in the sufficiency of letters to form an enforceable contract. This is true because such an executive may enter into hundreds of contracts through this medium during the course of a year, the legality of which may be the determining factor between success and failure for the period covered.

In the first place, in the light of the statutes of frauds, in order to form an enforceable contract by virtue of letters, some item or items of such correspondence must be signed by the party sought to be charged; and this signed item, or letter, if it is to be relied upon, must refer expressly to the contract sought to be enforced. It follows then, that a series of letters written by one party to such correspondence will not bind the second party, unless the latter's signature appears upon some item of the correspondence referring directly to, and affirming, the contract.

This point of commercial law has been frequently overlooked by well informed business executives, and has led to much costly and futile litigation in after attempts to enforce agreements, which were grounded upon correspondence, which fell short of charging the opposing party in this respect. This danger point is illustrated in a long line of well considered decisions, among them being Western Metals Co. vs. Hartman Ingot Metal Co., 303 Ill., 479. This case is perhaps one of the clearest on the point the books contain, and is well worth examination by every executive charged with the conduct of correspondence of this kind. The facts involved, as taken from the report were, briefly stated, as follows:

The president of the plaintiff company met the president of the defendant company by chance in Cleveland, Ohio, and there was some conversation between them relative to the sale of a quantity of scrap brass by the former to the latter. Thereafter the plaintiff wrote the defendant in confirmation of the sale, upon a printed blank, in substance, as follows:

"Confirmation * * * Sales Order No. 2053, Date November 2, 1918. Sold to Hartman Ingot Metal Company, Chicago, Ill. Terms, 30-day acceptance draft for 90% of the invoice, f. o. b. Chicago. Shipment to be made any time between now and 1/31/19.

"Quantity and material Prices
25 tons No. 1 red brass borings .....per lb. 20c
25 ton clean light brass .....per lb. 13c

After receiving the above letter of confirmation the defendant company, through its secretary, wrote the plaintiff as follows:

"Gentlemen: We will absolutely refuse to accept any shipments of metals until such a time as you are again notified by us to the contrary, owing to the fact that we are so badly congested here at the present time. Trusting you will give this matter your attention, we are," etc.

Following this, considerable correspondence passed between the parties, the plaintiff asking for shipping instructions, and the defendant declining to give them. Finally the defendant wrote the plaintiff as follows:

"On account of the government canceling orders on all purchases they have made, we are likewise canceling all written orders we have given our trade. We might have given you a verbal order, and this would be under the same ruling as all written orders we have given others."

After the receipt of the above letter the plaintiff brought an action against the defendant upon the contract,

Digitized by Google

and recovered a judgment for $4,500 in the lower court. This judgment was reversed in the Appellate Court, on the grounds that the action was barred by virtue of the statute of frauds, which provided as follows:

"A contract to sell or a sale of any goods * * * of the value of $500 or upwards shall not be enforceable by action unless some note or a memorandum in writing of the contract or sale be signed by the party to be charged or his agent in that behalf."

Following the judgment of the Appellate court the case was taken to the Illinois Supreme court where in reviewing the record, and in determining whether or not the correspondence outlined above satisfied the section of the statute of frauds quoted from, it was, in part, said:

"It is well established that a complete contract, binding under the statute of frauds, may be gathered from letters, writings, and telegrams between the parties relating to the subject-matter of the contract and so connected with each other that they may be fairly said to constitute one paper relating to the contract, though only one of the writings may be signed by the party to be charged. * * *

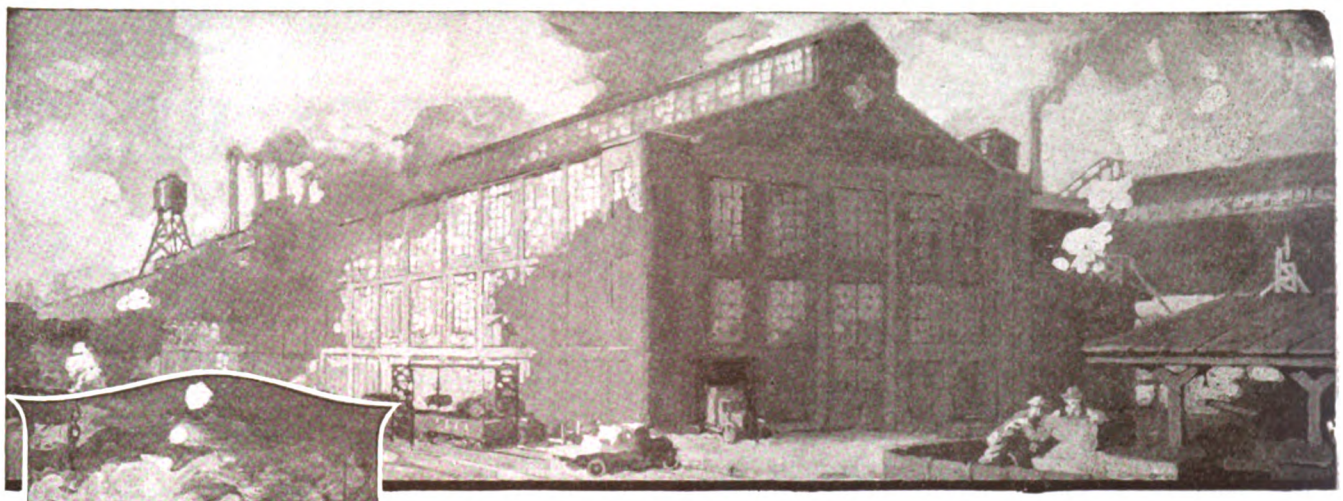
"It is equally well established that the signed writing or writings must refer expressly to the other writing, or the several writings must be so connected, either physically or otherwise, as to show by internal evidence that they relate to the same contract. * * * A paper signed by the party to be charged cannot be incorporated in a paper not signed by him by a reference in the letter. The signed paper must refer to the unsigned paper in clear and distinct terms. * * * "

After the above statement of the general rule governing the sufficiency of letters to form an enforceable contract, in the light of the statute of frauds, the court directed its attention to the correspondence in the instant case. In passing upon the sufficiency of these letters, the court, among other things, said:

"Turning, now, to the several writings in the case at bar, what do we find to connect them? It must be apparent to any one that the correspondence admitted the existence of a contract of sale, but that is not the question for us to decide. * * * The only question presented to us is whether there is a memorandum of this contract of sale, complete in all its terms, and signed by defendant in error. There is no contention that such a memorandum exists unless the letters signed by it are connected with the confirmation dated November 2, 1918, as to make the confirmation and the letters a memorandum sufficient to satisfy the requirements of the statute.

"The correspondence will be examined in vain in an effort to find the slightest reference to the confirmation. At no time does the defendant in error admit that the confirmation correctly states the terms

(*Continued on page 31*)





Even the most modern industrial buildings are made more profitable by these specialists

VENTILATION is a thing easily overlooked — a condition that does not demand attention until after production is under way.

When the new building is planned, every modern labor-saving device and method is considered. But it is only after the payroll has started that the menace of smoke, gas, heat, steam, foul air, or fumes makes itself apparent.

Arex engineers daily find new buildings in which the effectiveness of modern equipment is nullified by the lack of proper ventilation. They reveal hidden profits in every industry—men unable to perform efficiently—machinery not functioning properly—material spoiling because of conditions—hundreds of savings of such magnitude that the cost of their corrective system of siphonage ventilation is only incidental.

A rough sketch or blue print of your building attached to the specification blank below carrying a description of your conditions will bring you a complete survey by these experts without cost or obligation. Address Arex Company, Engineering Division, 1583 Conway Building, Chicago.

Arex Ventilation Is Used by the Leaders in Every Field of Industry

General Electric Company
Hart Parr Company
Quaker Oats Company
Oliver Plow Works
Pullman Company
National Biscuit Company
Wm. Wrigley, Jr. Company
Munson Steamship Company
American Car & Foundry Company
Corn Products Refining Company
Continental Can Company
American Can Company
National Carbon Company, Inc.
International Harvester Company
American Steel & Wire Company
Elgin National Watch Company
Henry Disston & Sons, Inc.
Western Electric Company
American Sheet & Tin Plate Company
Crane Company

Send rough sketch or blue print of building with data for engineer's analysis

AREX COMPANY
J. C. Kernchen, Pres.
INDUSTRIAL VENTILATING ENGINEERS

Arex Ventilation Engineering Survey **SPECIFICATION BLANK**

We desire to receive *Gratis* an engineer's analysis of the following building: ..... *State character of work or business building is used for*

We are troubled with: Fumes ☐ Smoke ☐ Foul Air ☐ Heat ☐ Condensation ☐ Steam ☐

Dimensions of Building: Width ..... Ft. Length ..... Ft. Ceiling Height ..... Ft.

Construction of Building: State whether Brick ☐ Concrete ☐ Frame ☐ Stucco ☐

Type of Roof: State whether Flat ☐ Slant ☐ Gable ☐ Sawtooth ☐ Monitor ☐

Pitch of Roof ..... State how many ..... inches to the foot .....

Location of Floor or Room to be ventilated .....

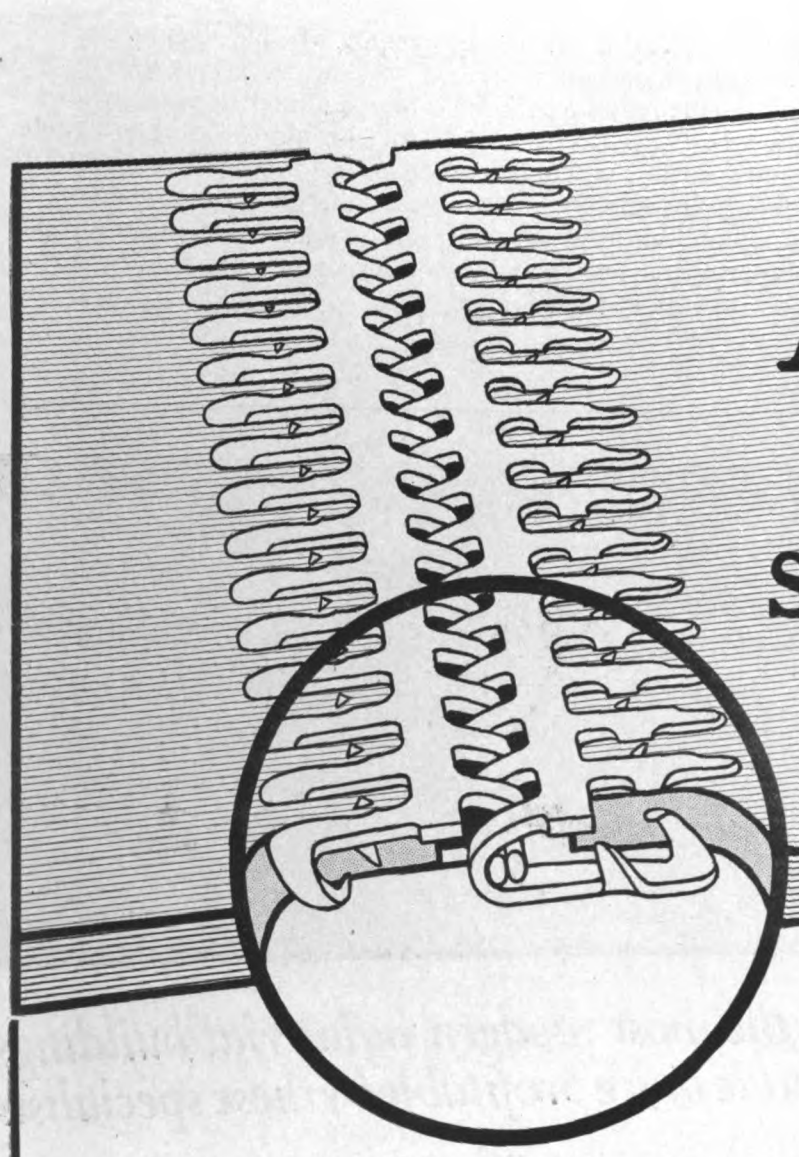
How high do adjoining Buildings extend over your Roof? .....

How many feet distant are the surrounding Buildings, or is your Building entirely unsurrounded? .....

..... Firm Name ..... Name of Individual ..... Title of Individual

..... Street Address ..... City ..... State

Digitized by Google



ALLIGATOR

TRADE MARK REGISTERED U. S. AND FOREIGN PAT. OFFICES

Scientific STEEL BELT LACING

Setting New Standards in Belting Performance

BELTS give longer uninterrupted service when laced with Alligator Steel Belt Lacing, for Alligator is the strongest and most durable of all belt lacings. It is scientifically and practically correct.

Every Alligator tooth is a vise, clinching around the belt fibres, holding them in equal permanent service.

Practically all authorities on belt transmission recommend Alligator. It is in every day use on millions of belts of every type and size and in every service. Sold at wholesale and retail the world over.

Flexible Steel Lacing Company
4639 Lexington Street, Chicago
In England at 135 Finsbury Pave, London, E. C. 2

From the Standpoint of Science

Alligator teeth penetrate lengthwise of the belt leaving the long burden bearing fibres intact. Each tooth clinches down over its group of fibres, compressing them firmly so that there is no internal friction and wear at the belt end. Likewise the sectional steel hinge pin eliminates wear, the smooth oval bases rocking against each other.

Keep these vital features in mind when you buy belt lacing for the cost of any lacing is nothing as compared to the cost of the belt on which it serves.



"Never Lets Go"

Digitized by Google

THE SEAT OF
Production



No. FS-22, Patented.
Adjustable Legs and
Back-Rest

Stools and chairs that cost you less are costing you more than "Royal-Chicago" Scientifically designed seating every single day you are using them.

Royal Metal Mfg. Co.
2312-22 S. Western Ave. Chicago

"Royal-Chicago"
PRODUCTS
THE CORRECT INDUSTRIAL SEATING

(*Continued from page 29*)

of the contract. In fact, defendant in error does not even admit in its correspondence the existence of the oral contract of sale, there is nothing in the letters, or in any paper to which the letters refer, that states any of the terms of the contract.

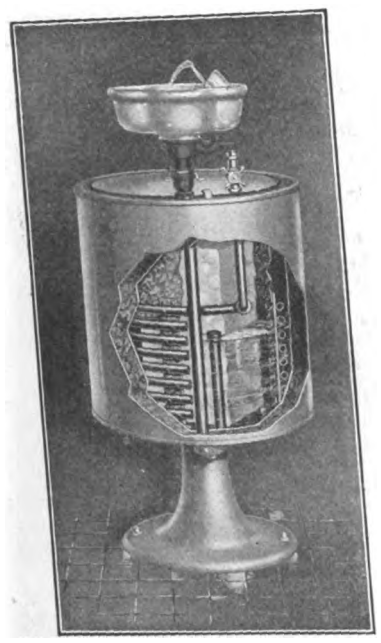
"It is unquestionably the law that the memorandum upon which it is sought to charge a party to a contract must state the contract with such certainty that its essentials can be shown from the signed writing, or by some reference contained in the signed writing to some other writing, without recourse to parol proof to supply the essential elements of the contract or to supply the connecting links between the signed writing and some other writing or writings. It is clear that the correspondence offered in evidence in this case does not meet these requirements. * * * "

In conclusion the Illinois Supreme court affirmed the judgment of the Appellate court. Holding, as outlined in the opinion, that the correspondence in the record was clearly insufficient to satisfy the requirements of the statute of frauds and make an enforceable contract.

The foregoing decision is obviously one of great force and clearness on the point decided, and in the light of the facts in evidence the correctness of the court's conclusion cannot be questioned. Nowhere in the correspondence did the defendant in error sign any memorandum that affirmed, acknowledged or admitted, the terms of the contract that the plaintiff in error sought to enforce, as required by the statute of frauds. Truly this decision, when examined in connection with the correspondence outlined, is one of value for every executive having in charge correspondence designed to lead to the formation of contracts of sale or purchase, as it illustrates in a striking manner what at least will *not* make an enforceable contract in situations of this kind.



Digitized by Google



No. 570A

DOES THIRST QUENCHING COST YOU $18000.00 PER YEAR?

With 1000 employees in your factory at an average wage of 30 cents per hour—six drinks per day, two minutes per drink—the cost of thirst quenching is $60 per day or $18000.00 per year.

If your workmen are compelled to wait in vain for the water to cool, your pro rata cost is more.

Halsey Taylor instantaneous Cooler Fountains at frequent intervals throughout your plant save valuable working time and increase efficiency and production.

There are vital reasons why more than a score of corporations have each between 100 and 1000 Halsey Taylor Fountains in use:—The time-saving element, increased efficiency on the part of the workmen, and the superior Halsey Taylor construction with three important exclusive features, including positive and uniform control of the height of the stream.

Write for new 32-page catalog.

The Halsey Taylor Co.
WARREN, OHIO

BRANCHES

NEW YORK CITY
137 East 43rd Street

CHICAGO
1702 North Talman Ave.

PHILADELPHIA
5224 Green Street

KANSAS CITY
3838 Troost Ave.

BOSTON
46 Cornhill—Room 512

SAN FRANCISCO
237 Rialto Building

HALSEY TAYLOR

The Economic Importance of Pure Drinking Water

BY SANFORD DEHART

Director of Hospital and Employment Manager, The R. K. LeBlond Machine Company

RECENTLY two investigators were able to prove that drinking fountains, which were considered sanitary, were the positive source of contamination in transferring communicable diseases.

Several of these fountains discharged water vertically with a jet less than one inch, necessitating the consumer's lips coming in contact with the nozzle.

It has long been known that so called sanitary drinking fountains are subject to contamination unless the water is discharged from fountains at an angle, and the nozzle protected by some device which prevents the consumer's lips coming in contact with it. The ordinary spring faucet inverted and protected by a wire guard mounted on a tripod is infinitely more sanitary than a drinking fountain discharging water one or two inches vertically, which is not protected against the approach of the drinker by a wire muzzle or guard.

An investigation of types of drinking fountains, by the Board of Health of Minnesota, at the University of Minnesota, showed that of fifteen types examined, many of which were of the continuous-flow type and discharge water vertically, were all subject to contamination by the consumer, either directly by the lips or by falling back from the lips upon the jet or the surrounding parts.

There are several cases on record where it has proved costly for employers to furnish employees with drinking water without taking all precautions to protect it from pollution.

It cost one large manufacturing concern $150,000 and another $100,000 in the past six years for claims arising from a typhoid epidemic in their shops, which was directly traceable to contaminated drinking water.

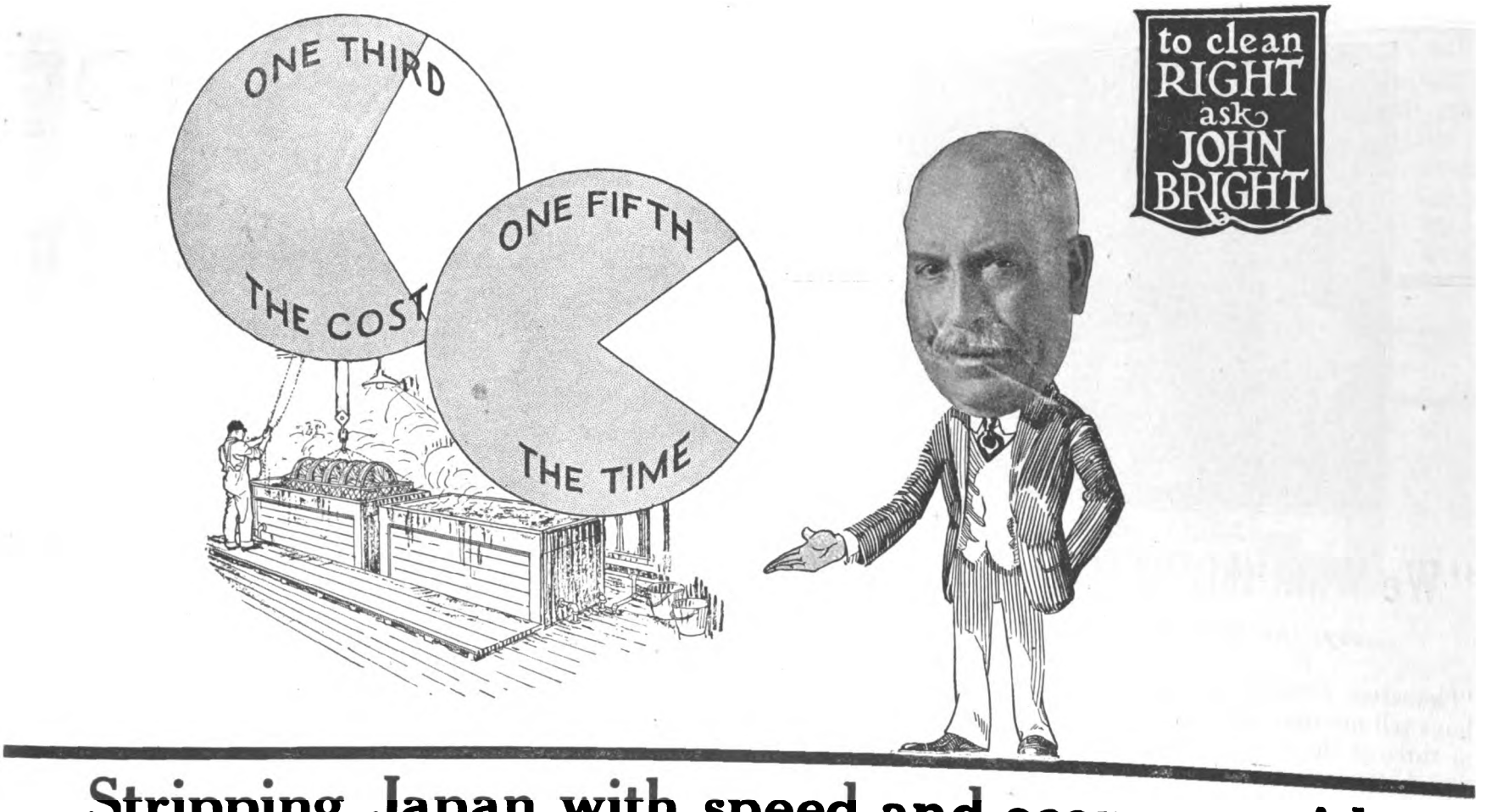
Most states require the employer to furnish pure water to the employees. In New York the law says that drinking water shall be supplied at all times, in places accessible to the employees, and shall be cold. In this state the water must be supplied through proper pipe connections. Where water is placed in receptacles in the factory, these must be properly covered to prevent contamination, and be thoroughly cleaned at regular intervals. The law goes on:

"In mines it shall be the duty of the operator of every mine to provide a good quantity of drinking water for the use of all men employed in the mine, a supply of which shall be provided on each main working level, and it shall be the further duty of the superintendent to cause such supply of water to be adequately protected from contamination."

There is no better way of transmitting diseases of a communicable character than by the common drinking cup. Many persons have contracted diseases from the public drinking cup, among which might be mentioned, tuberculosis, syphilis, tonsilitis, La Grippe, etc. This list is intended to be suggestive rather than exhaustive. Practically every state in the Union has abolished the use of the common drinking cup in all public places, by state law or regulations of the State Board of Health. A drinking fountain with an angle stream will

(*Continued on page 35*)

Digitized by Google



Stripping Japan with speed and economy with International Compound No.2B at 8c a pound

A GREAT Wire Wheel Plant was spending too much time and money in its cleaning department. One operation was particularly costly: The removal of the three coats of baked black Japan from the wheels.

A solution costing 10 cents per gallon took five hours to strip the work, and even then the Japan was not thoroughly removed. It was almost invariably necessary to brush the wheels after they were taken from the tanks.

Then International Compound No. 2B was introduced. It cost 3 cents per gallon and removed every trace of Japan in only one hour.

Better cleaning results are now being obtained with a great saving of labor, at approximately one-third the cost of material and one-fifth the time.

Of course INTERNATIONAL COMPOUND No. 2B will not strip every japan job in less than an hour, but it will strip any kind of japan or paint quicker and cheaper than you are doing it at present. Let me prove this to you by shipping you a barrel for trial. If it doesn't do all I claim, return what is left after testing and cancel our invoice. Awaiting your trial order,

Internationally yours
John Bright

International Products
I.C.C.
International Chemical Co.

INTERNATIONAL CHEMICAL CO.

PHILADELPHIA ~~~~~ PENNA.

Digitized by Google



"We Want this RED CAP Broom!"

—says the Superintendent to the P. A.

"Hereafter, Fred, let's standardize on RED CAPS. The boys tell me that one of these RED CAPS outlasts two or three of the wire-wound brooms we've been using, and does better work. They say the bamboo center knocks loose heavy dirt and grit that they couldn't budge before. And these RED CAPS are saving us real money on our broom purchases, as well as in our cost of cleaning."

CAPITAL "Red Cap" Brooms are built for long, hard service by an organization whose entire facilities are devoted to making highly specialized industrial cleaning equipment. This explains the superiority of CAPITAL Brooms and Brushes over ordinary goods.

"Red Cap" Brooms are built in a wide metal case, nailed from each side with wrought iron nails, with an extra metal re-inforcing band and sewed with heavy waxed twine. The materials are carefully selected corn and split bamboo, all-corn, or corn and soft, round rattan.

CAPITAL
Industrial Brooms and Brushes

Meet Every Industrial Need

The CAPITAL Line covers practically every requirement in mill and factory brooms, push brooms, floor brushes, bench and counter dusters, railroad brooms, etc. Right now, in your plant, there is a chance to secure better results, and effect big savings, by replacing your present brush and broom equipment with units from the CAPITAL Line.



Select from Catalog 17—Then Order from Your Jobber

Catalog No. 17 illustrates and describes the entire CAPITAL Line. It is a valuable reference book for the store-keeper, superintendent and purchasing agent. Sent free on receipt of the coupon printed below. After making your selection, order from your jobber. He will fill your orders under our guarantee of absolute satisfaction, whi h permits you to return any unsatisfactory goods for full credit, carrying charges both ways paid by us.

Send for Catalog 17 Today—Use the Coupon

INDIANAPOLIS BRUSH & BROOM MFG. CO.
I. W. LEMAUX, President
130 Brush Street Indianapolis, Ind.

MAIL THIS COUPON

Indianapolis Brush & Broom Mfg. Co.,
130 Brush Street, Indianapolis, Ind.
Send us Catalog 17, and the name of your nearest jobber.
Name .....
Address .....

BYERS PIPE

GENUINE WROUGHT IRON



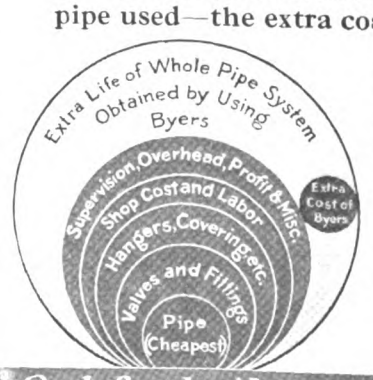
Over 30 Years' Service

Over 30 years ago, Byers Pipe was installed in these two buildings, ranking among the finest and largest of their day. In the heating, plumbing, drainage and steam systems, this pipe has served faithfully through all these years.

Pipe repairs have been negligible. The great bulk of the piping, aggregating many miles in length, most of it concealed in walls and floors, still functions perfectly. In all probability, it will continue to do so as long as the buildings remain in use.

The superior rust resistance of Byers pipe has, in recent years. become a notable and outstanding fact, especially in view of the many unfortunate experiences in buildings of more recent construction in which only slightly cheaper pipe has been installed.

In proportion to the total cost of a pipe system—the life of which depends so largely on the rust resistance of the pipe used—the extra cost of Byers Pipe is trifling.



Byers Bulletin No. 38 "The Installation Cost of Pipe" contains cost analyses of a variety of pipe systems, with notes on corrosive conditions in each. Ask for a copy.

A. M. BYERS COMPANY
PITTSBURGH, PA. ESTABLISHED 1864

New York Philadelphia Boston
Chicago Tulsa Los Angeles
Cleveland Houston

Look for the Name and Year rolled in every length

Digitized by Google

(*Continued from page 32*)

entirely eliminate the cup problem. A good sanitary drinking fountain is an investment with guaranteed dividends.

The Wisconsin Industrial Commission requires each place of employment to be supplied with adequate drinking water fixtures and the faucets or outlets for these to be placed convenient to the employes. Individual cups must be used or sanitary drinking fountains must be installed.

The Supreme Court of Wisconsin has held that illness and death from contaminated drinking water supply in an industrial plant is an accident within the meaning of the Workmen's Compensation Act.

The Appellate Court of Indiana in a recently reported case has declared typhoid fever compensable under the Workmen's Compensation Act. The Court was of the opinion that the entering of typhoid fever germs into the workman's intestines, by reason of his drinking polluted water furnished him by the company while in its employ might rightfully be termed an accident and as such was compensable.

It is well to know that water of absolute purity is not found in nature. The purest water is absolutely devoid of taste. Distilled water is not palatable. Boiled water will make all the germs harmless, though the water may remain as muddy as ever. The palatability of boiled water can be restored by aerating it.

The best methods of purification are filteration and distillation. If no other means are available, boiling will always sterilize drinking water. The Cooper Hewitt Mercury-Vapor Lamps, used in many factories for illuminating purposes have been used successfully in the sterilization of water.

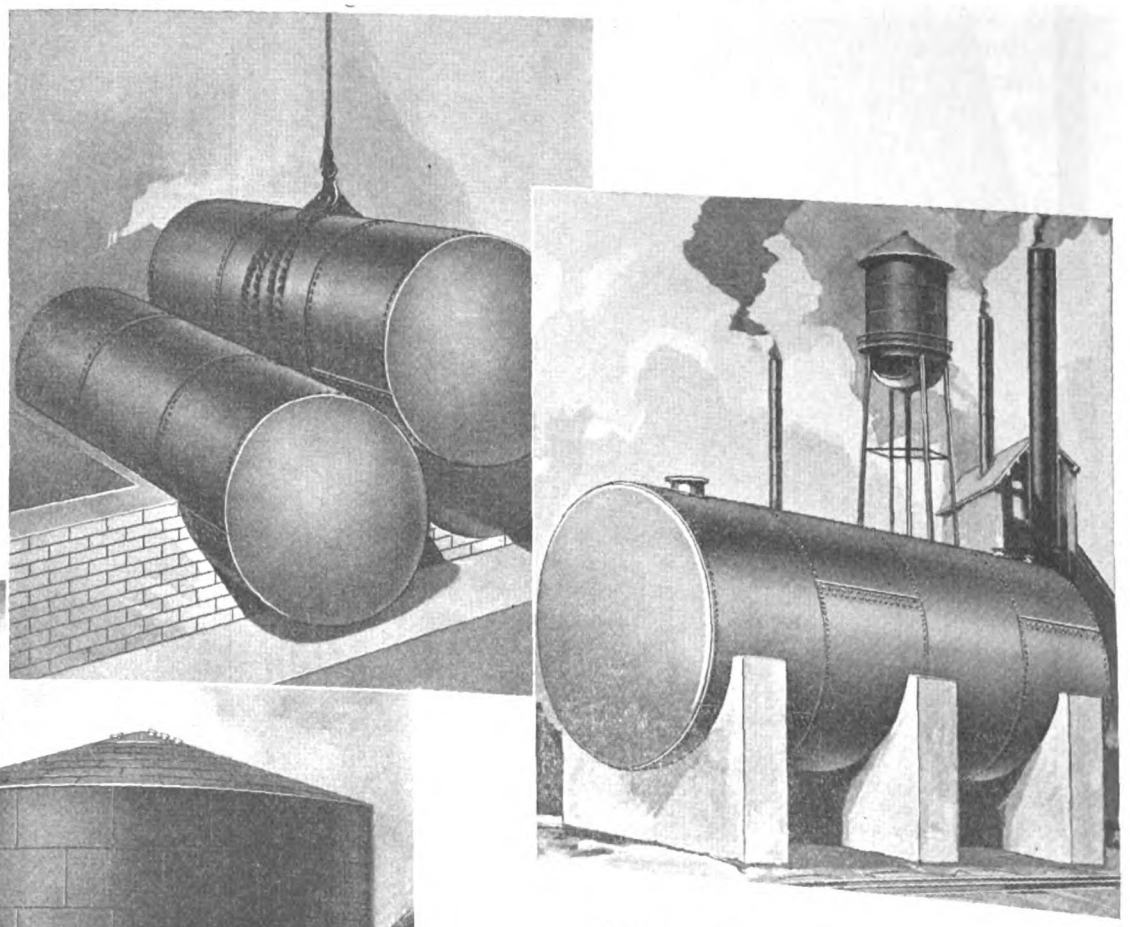
Several pharmaceutical houses manufacture preparations for sterilizing water. One that was devised by Drs. H. D. Dakin and E. K. Dunham, was used extensively during the war to sterilize contaminated water. One tablet will sterilize a quart of water. The water should be allowed to stand for thirty minutes before drinking. Fifteen cents worth of Calcium Hypochlorite, which can be purchased in any drug store will sterilize a full sixty gallons of water.

Where tanks are used much care should be given the proper construction and location.

Dr. S. Dana Hubbard, superintendent, Division Industrial Hygiene, New York City Department of Health in an article recently in the "Nation's Health," says:

"In the shop the drinking water should be carefully supervised. Many instances of tank collection on the roof have shown the necessity for this supervision. Animals seeking water get drowned in these unprotected tanks and a floating carcass is not unusual to be observed by our inspectors. Sediment, especially when tanks are in the vicinity of dust producing places, collects quickly in the bottom and on the surface and either discolors or flavors the water with a

LANCASTER TANKS
STEEL PLATE CONSTRUCTION



Field Storage
Horizontal Storage
Pressure
Rectangular Open Top
Jacketed
Mixing

ANY work that has been designed and built by LANCASTER is safe. If a tank, you will know that it will not leak, give way or cause damage because it has been made by men experienced in putting steel plates together into various products, who know what should be used and how it should be used and who see that all work is properly done. There is a quality of workmanship about Lancaster's tanks which stamps them as coming from a shop where men take pride in their work.

Our Service Department has compiled three books of practical value to users of Tanks. Book J-1 Prices and Specifications 303 sizes Horizontal Storage Tanks, 100 to 25,000 Gallons. Book J-2 Storage Tanks from 1,000 to 74,000 Barrels. Book J-3 Prices and Specifications of 134 Standard Sizes Pressure Tanks. Any or all of these books sent free upon request.

LANCASTER IRON WORKS
LANCASTER, PA.
New York Office
501 Fifth Ave.
Philadelphia
Wesley Building

Digitized by Google



Fully Guaranteed

STRENGTH

This broom will not crack at the shoulders nor shed its fibre. Knock it against heavy machinery or sharp corners and you can't hurt it. It is sturdily built for hard, long use.

The heavy metal case is a real protection against the cracking and splintering of the fibre at the shoulders. The wide case with the auxiliary bindings of metal and strong twine, keep the fibre firm and resilient during the entire life of the broom.

See how the fibre is held. No straight nails here; it's held immovable in the grip of heavy wire staples. There will be no falling fibre from this construction.

All of the materials going into the make-up of one of these brooms is of the highest grade that can be had. They are made of selected grades of broom-corn, rattan, bamboo or hickory. We stake our reputation upon the quality of each one of our products. You are perfectly safe in specifying

LAY METAL CASE BROOMS

because we guarantee them fully. For forty-six years we have been filling thousands of sweeping needs in all kinds of factories, until now we supply 90% of the Steel industries, 40% of the railroads and more than 4,000 industrials.

In addition to our metal case brooms, we manufacture a very durable line of all kinds of industrial brushes. Our long experience in the manufacture of sweeping utensils, assures your satisfaction of Lay products.

Let us prescribe for your sweeping needs. Write today for our prices.

Originators of the Metal Case Broom.

JOSEPH LAY COMPANY
120 College Street
RIDGEVILLE INDIANA



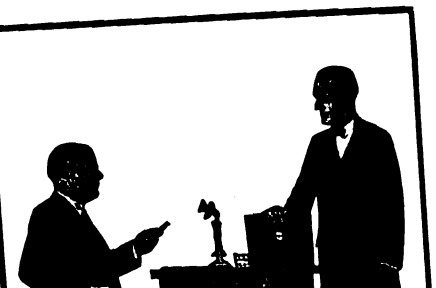
disagreeable taste. The roof of a water tank is rarely ever painted or metal protected and this cover when made, being exposed to debris gives the water a distinct "woody" taste and smell. The roof tank is also a mosquito breeder when it is uncovered. The location of the water tank is deserving of consideration as quite a number of tanks have been found located in improper places. This division is now trying to have some factories remove the water tank from water closet compartments. No doubt here, with improper ventilation the drinking water may become foul or contaminated, especially as in one instance a woman was found washing her hands in the tank after performing the function at the toilet. It seems unbelievable that a drinking water tank would be purposely placed in such locations, but where room is scarce and rents are high the propriety of such is scarcely questioned by those indifferent to the health of the worker of the community."

Some industrial managers labor under the fallacy that impure water is found only in rural communities. The Illinois Department of Health made a survey of the municipal water supplies of that state. They found of the 45.9 municipal water supplies, 77.5 per cent were good, 14.6 per cent were doubtful and 7.9 per cent were bad.

Eight years ago the water supply of Chicago was not safeguarded. Numerous cases of typhoid fever were caused by contaminated water; today the water supply is completely chlorinated and typhoid fever deaths are the lowest of any large city in the world.

From the foregoing it will be seen that illness arising from defective drinking fixtures or from polluted water is preventable. It behooves the management of an industrial plant to take the fullest advantage of methods which have been developed by sanitary enginers.

To try to save on drinking water and fixtures is to carry frugality beyond the genuine limit point of economy.



"IT'S YOUR ORDER, Because Your Company Has a PHOTOSTAT."

"This is a job where delivery is paramount. And, in every case, I have made it a point to find out what kind of equipment the bidder had in order to make good his promise.

"Your Company has a piece of equipment on which I have learned to rely. I know what the PHOTOSTAT is and what it can do. I know you will not have to lose any time tracing. You can make PHOTOSTAT copies and get started on your shop work right away. In other words you'll be days ahead and I also know that there can't be any mistakes in PHOTOSTAT copies.

"Yes, sir, you tell your chief he can thank the PHOTOSTAT for this order. I know you'll make delivery with that machine to help you."

PHOTOSTAT prints cost cents. Compare this with what it costs for a draftsman to make a tracing, a stenographer to copy a page, or an artist to reproduce a layout.

The experiences of many users, written in letter form, are contained in our booklet, "A Good Word for the PHOTOSTAT." Write for your copy today.

PHOTOSTAT CORPORATION
295 STATE ST., ROCHESTER, N. Y.

88 Broad St., Boston
123 W. Madison St., Chicago
209 Leader Bldg., Cleveland
7 Dey St., New York City
510 No. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington

Executive Office: Providence, R. I.

PHOTOSTAT
Trade Mark

Digitized by Google

Too Much Jazz

BY PHIL M. CONLEY

I JOINED a group of intelligent business and professional men recently standing in a hotel lobby. Just as I came up, one of the men, a prominent bank cashier said: "The only way you can handle labor is to starve them into submission. When a fellow gets hungry he will listen to reason."

I made the mistake of taking issue with his remarks. I asked: "Have you forgot your history that gave the causes which led up to the French Revolution? Have you read Napoleon's statement that he never liked to fight a hungry army? Do you remember the story of Runneymede where the English people forced King John to grant Magna Charta because he tried to starve them into submission? Do you recall the history of our own United States when King George III tried to starve the colonists into submission and as a result the American Revolution freed us from the mother country?"

My questions were not answered. They did not seem to interest either the banker or the other men in the group. The banker informed me that we were dealing with present day conditions, an age of machinery, which had no relations to history or times that were entirely different in spirit and import. The general attitude of the group was that labor must be dealt with in a stern manner. It was a war to the last ditch. And one of the strategic moves in any war is to cut off the food supply.

I sat with a committee recently which had for its object the working out of a plan to settle a strike and to kill the influence of labor union activities. A clever lawyer who had fought many legal battles for employers and corporations addressed the committee: "Gentlemen, the only way we can effectively curb the activities of the union is to secure an injunction against the members picketing, and prevent them interfering with the workmen we employ. As soon as the injunction is issued we can have the leaders arrested and before they are released the strike will be broken. Then, gentlemen, we will frame an industrial act for the legislature that will do away with labor unions in this state."

I did not comment. What I wanted was the point of view of the progressive business men in the group who accepted this brilliant attorney's advice. They thought he was original. At least they kidded themselves into thinking his plan was new in order to patch up their difficulties so they could resume work. It seemed their only thought was to get back to work at any cost.

They did not concede even to themselves that the plan proposed had been tried many years with disastrous results to employers and to industry. The spirit of war was the attitude of the committee. And the only military tactics the general, their attorney, knew was to fight with legal procedure.

I have just finished reading a lengthy report made by a committee of ministers who attempted to investigate a difference between a group of employers and employes. It contained some information and a great deal of misinformation. Before I was half through I concluded the divines had more sentiment than sense. I was forced to the conclusion that professional spiritual leaders should stick to their jobs.

The report would have us believe that never before have people suffered, and that laboring men have never been subjected to unpleasant condifact that suffering and misery tions. They overlooked the have existed ever since the world began. However, this is no excuse for continuing poor conditions for the laboring man in this generation.

But if the ministers had made an impartial, intelligent investigation, without prejudice and without sentimentality as their inspiration, they would have reported that conditions were not what they should be, but that they were infinitely better than they were a few years ago and that they were continually being improved. They would have



Digitized by Google

found more humanitarian treatment on the part of employers of today than has ever existed in the history of the world.

I have read numerous magazine and newspaper stories recently relative to the so-called problems in industry. Many of them have been amusing on account of the serious intent of their authors. They give the impression that they have discovered something and that unless their opinions are accepted immediately the world will be lost.

For the most part these stories have been interesting. They have been written for public consumption, and in order to interest the public, stories must be news of a more or less sensational nature. But it must be conceded that it is impossible for a person to go into a coal field and make a three day investigation then write a story covering the entire situation and give intelligent suggestions concerning ways and means of correcting the difficulties of the labor troubles.

The press has done a great deal to inform the public concerning this matter. But journalists cannot solve the labor problems. They do not know labor conditions except as they are told about them. Manifestly they want to be fair, but they are human beings and their point of view is shaped by the opinions of the people with whom they talk.

Some trained professional men have gone into shops, mines and mills; worked as laborers; and then reported verbatim conversations they have had with workmen. They have given detailed descriptions of conditions as they have seen them. Very interesting. But the whole procedure reminds one of Empey's "Over the Top" book. He described one sector, and that a small one, of the battle front.

I have read magazine articles and books written by these temporary laborers. I confess I have been disappointed. While they honestly attempt to point out the many sides of the question, they fail to give a solution. I remember the five years I spent in a machine shop earning my daily bread. The stories told by these volunteer workmen have not impressed me. They are merely narratives of surface conditions.

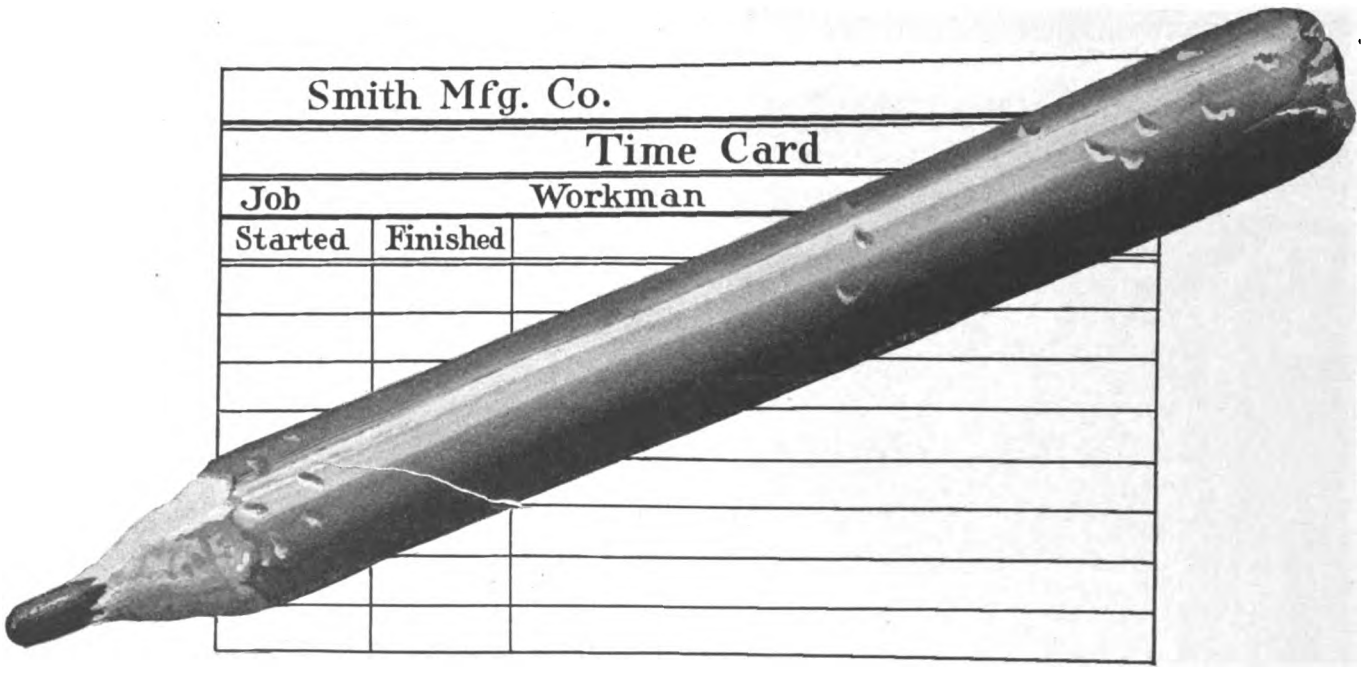
Practically every week some enthusiast in Congress decides that he will settle the whole matter between capital and labor. He either proposes a law or an investigation. Newspapers carry excerpts from his speeches and his full comments are placed in the Congressional Record. Some of his constituents read about his efforts and comment that he is doing good work for his country. Then when he is up for re-election, he refers to the wonderful record he made in Congress.

An investigating committee from Congress is frequently appointed. It works for at least a week hearing testimony, all of which is compiled in an elaborate report. After a lot of talk, some of which reaches the newspapers; the report is filed. Still the problems of industry remain unsolved.

(Continued on page 41)



Digitized by Google



How many of your time records are kept with this pencil stub?

ARE you still using the old pencil and paper system of keeping the time on each job? If you are, it's a ten to one bet that your cost records are inaccurate.

Machine operators are poor time keepers and always will be. Their interests are centered in other matters. And when a job is finished they guess at the time which it took. Those guesses go to form the basis of all your cost data if you are allowing each operator to figure his own time.

Why persist in letting your mechanics guess at the time each job takes? Why not install a machine that records the elapsed time by a simple pull on a lever?



The Calculagraph is a spring-driven machine free from the wiring troubles of electrical time recorders. It stamps the starting, stopping and *elapsed time* right on the job ticket.

It eliminates all errors on the part of the operator. He no longer guesses. The printed record is there as proof.

It saves the time of cost clerks. They no longer need to subtract starting from stopping time. The *elapsed time* can be read direct from the job ticket.

Any number of workmen can use one Calculagraph. A backward-forward movement of the right hand lever when the job starts, a pull of the left hand lever when the job is done, and the time record is complete.

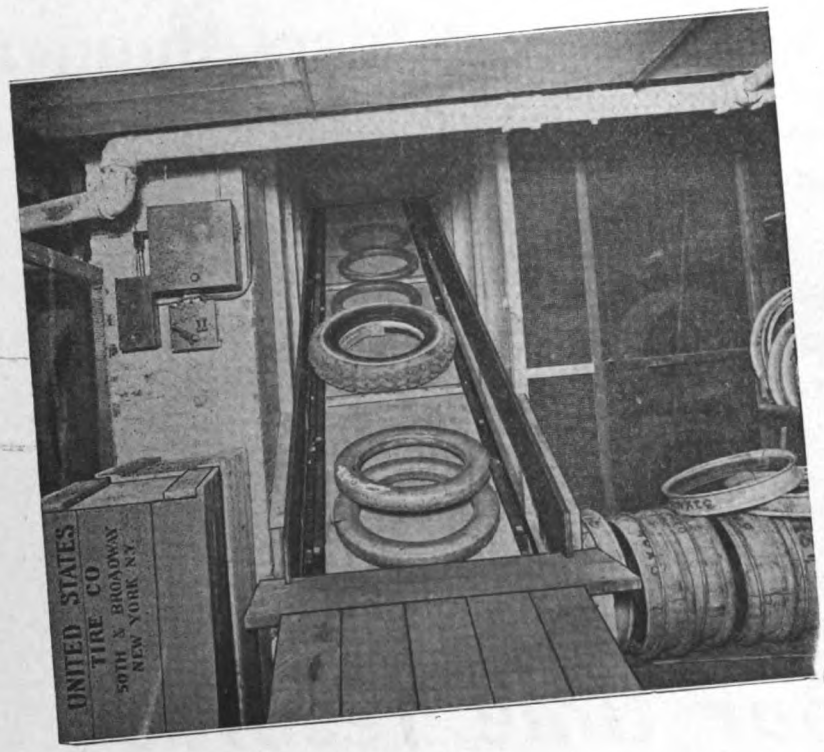
Send for our booklet "Elapsed Time Records" today. It will interest you.

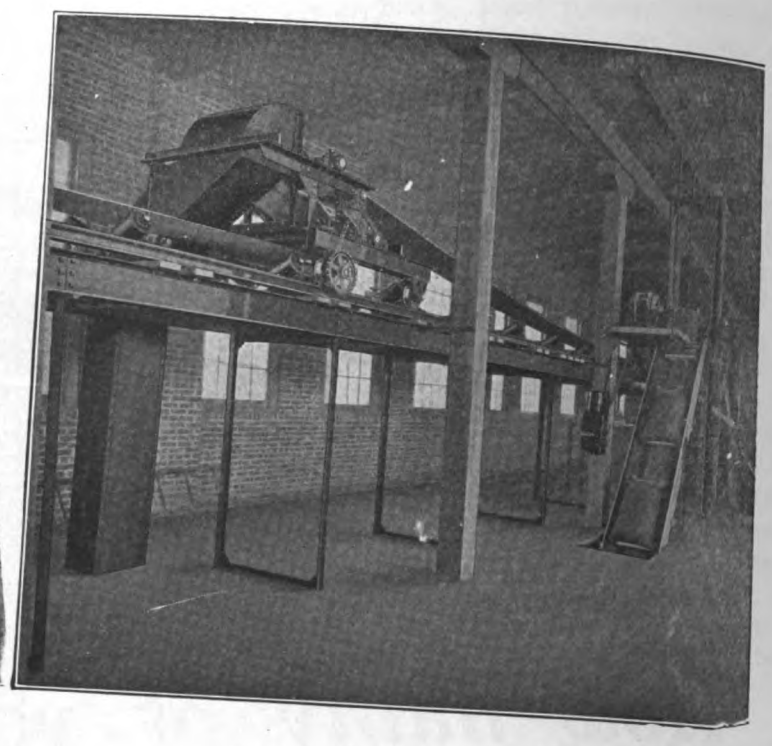
THE CALCULAGRAPH

THE ELAPSED TIME RECORDER

34 Church Street **New York City**

Digitized by Google





How does your present production compare with that of a year or six months ago?

If your production remains about the same it is very likely that you are dis-satisfied with the status of your business. If this is the situation production should be increased because genuine prosperity is the result of maximum production—smaller unit profits and increased sales.

A Conveying System not only increases production but it is the means of controlling it. Your present equipment plus a Conveying System designed to meet your individual conditions will yield a production far in excess of that which you are producing at present.

Conveying Systems to function properly must be designed to meet specific requirements. This requires making a survey of your plant, studying your operations, determining desired production so that data can be secured which will enable us to design a conveying system which will enhance your production.

Adequate production will make your business prosperous. Lose no time. Communicate with us at once. Write us immediately advising time convenient to confer with our engineers.

SAMUEL OLSON & CO.

Loose, Bulk and Packed MATERIAL HANDLING SYSTEMS

2414 Bloomingdale Ave.
CHICAGO, ILLINOIS

202 5th Ave.
NEW YORK, N. Y.

Digitized by Google

(*Continued from page 38*)

There is too much jazz on the subject. There are too many "quacks" trying to prescribe for an ailment about which they know nothing. There are too many "shyster" lawyers arguing the case. There is an attempt to clutter up the over crowded law books with statutes designed to settle this matter, all the time forgetting that laws cannot adjust human relationships.

If I were to tell the bank cashier how to run his bank, he would think I was a fool. If I were to offer suggestions to the lawyer about how to argue his cases, he would bow me out of his office. And the same would be true of the other business and professional men who are interested in this great factor in our economic life. They mean right, but they are ignorant of the fundamentals of the subject.

In my opinion, and I am possibly adding another jazz note to this much jazzed subject, I think that the industrial subject should be left to the men who are professionally trained and capable of handling it. They are face to face with the situation; they understand conditions; they are not theorists or dreamers; they are actors.

If I had a tooth that needed attention, I would not go to a blacksmith. And most assuredly if I had an industrial problem to meet I would not go to someone who knows nothing about the subject.

Putting Coal on the Wire

(*Continued from page 11*)

barges on the river to the bunkers from which the coal flows by gravity into chutes connecting with the automatic stokers on the floors of the boiler rooms. The coal handling force consists of the tower engineer, his assistant, a tripper, a weigher, and two men in the barges.

We have followed the coal to the automatic stokers. There, by a series of reciprocating plungers, an evenly regulated and unbroken supply of fuel is forced into the firebeds of 146 water tube boilers. These giants, each of 650 horsepower, 200 pounds steam pressure, and 100 degrees superheat, are arranged in batteries of six, back to back. the operator of a private power plant, or any other man really interested in the production of steam, could feast his eyes for days upon days in the boiler rooms of Waterside and then not get his fill. It is hardly feasible therefore, to attempt here a detailed description of those rooms.

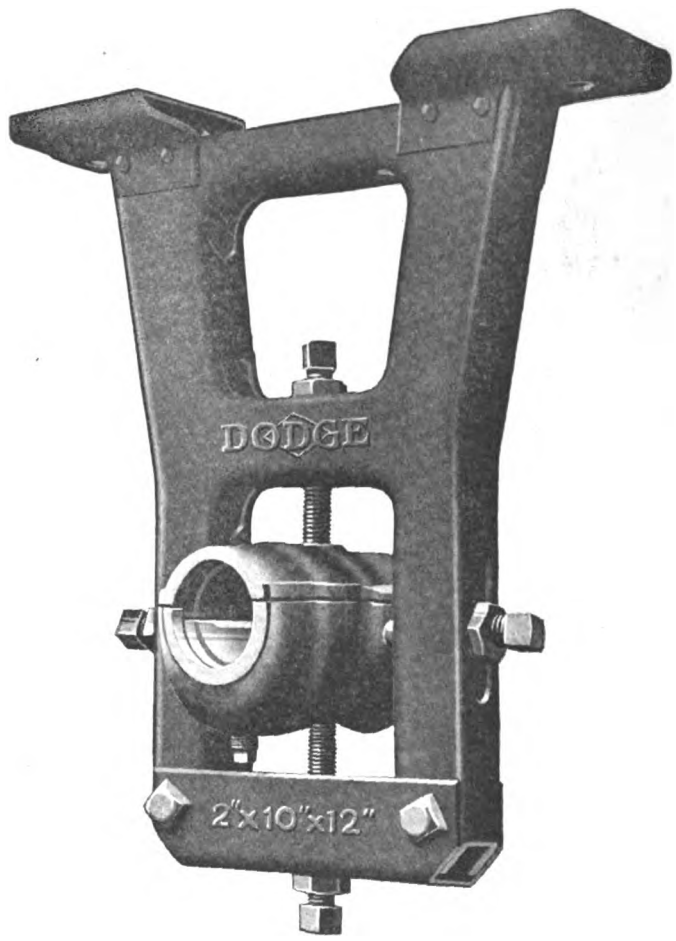
Three features may be cited as typical of the improvements constantly being made to raise the efficiency of the central station. Perhaps the most important of these is the centralized air control system which enables one man, the boiler room engineer, in Waterside No. 2 to control the air for all 92 boilers in the building; and the engineer in Waterside No. 1 to govern from one point the air for the 54 boilers in that building. Prior to the installation of this system, one man on each battery of six boilers controlled the air for his battery. Disregarding entirely the saving in man-power effected by the change, it is easy for anyone at all familiar with the importance of the air factor in steam generation and with the necessity of keeping steam pressure steady in an electric power generating plant to appreciate the great stride toward uniformity made by the change from local to centralized air control.

Then there is a signalling system, an ordinary carriage call electric sign such as is seen outside any theatre, which tells the boiler room engineer throughout the day and night how many boilers it will be necessary for him to have in operation in the next half hour in order to take care of the rising or falling electrical load. This device is controlled by the System Operator's Office, an extremely important development in central station operation concerning which more will be said later.

A third improvement, the results of which are apparent, even before one enters the building, from a glance at the smokestacks towering 300 feet above Waterside, is a cinder catcher which removes 93 per cent of the solids that formerly went up into the air. The smoke from Waterside today is practically cinderless and colorless.

(*Continued on page 43*)

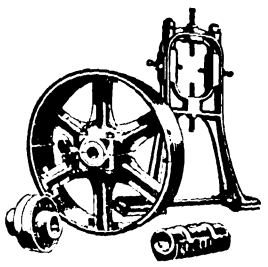
A Pressed Steel Hanger
guaranteed by
DODGE



"THERE is a practical hanger" is the opinion of experienced millwrights who examine this popular addition to the Dodge line of power transmission equipment.

It is light—strong—safe—easy to erect—unbreakable and low priced. Two years of careful experiment is embodied in its design and construction—it has withstood tests far more severe than any that will ever be encountered in regular line shaft service.

Dodge steel hangers are guaranteed by Dodge Quality which has been recognized for over forty years as an assurance of low first cost, low upkeep expense and continuous trouble-free performance.



Buy Dodge steel hangers as well as pulleys, clutches, couplings, collars, etc., from your local dealer on the immediate delivery basis.

DODGE
Power Transmission Machinery

DODGE MANUFACTURING CORPORATION

General Office: Mishawaka, Indiana; Works: Mishawaka, Ind., and Oneida, N.Y.

New York, Boston, Philadelphia, Pittsburg, Cincinnati, Houston, Chicago, St. Louis, Atlanta, Minneapolis, Seattle, San Francisco, Newark, Oneida

Digitized by Google



"COMRADES OF PROGRESS"

"THE TRACKLESS TRAIN" is the materials-movement system based on the principles of the steam railroad—transportation principles which have withstood the test of time for over an hundred years.

These principles are in brief:—The motive unit, being separate from the train, works continuously and wastes no time loading and unloading at terminal points. The power unit utilizes to the fullest its ability to work by pulling its burden instead of carrying the burden on its back. Correct in principle and possessed of the further advantage of being unrestricted to a fixed track or path and able to go anywhere a man can push a hand truck; "The Trackless Train" is beyond question the most efficient known method of freight-house, warehouse and industrial plant transportation.

As originators of the system we offer the services of an experienced consultation staff and manufacture the equipment. Write for descriptive literature or request us to have a representative call.

Mercury Manufacturing Company

CHICAGO **U. S. A.**

A partial list of Mercury customers all of whom operate FLEETS of Mercury tractors. (Note: A fleet in this instance indicates not less than five machines.)

American Railway Express Company
American Radiator Company
Armour and Company
Illinois Glass Company
American Window Glass Company
Kewanee Boiler Company
General Electric Company
American Sheet & Tin Plate Co.
Endicott Johnson Company
National Malleable Castings Co.
Standard Oil Company
Wilson & Company
Union Stock Yards & Transit Co.
Brooklyn Union Gas Company
Pennsylvania Railroad Company
Southern Lumber Company
Firestone Tire & Rubber Co.
Proctor Gamble Company

The Mercury tractor is built in five distinct types and fifteen different models. There are twenty-five kinds of trailers to meet the usual requirements and we design special trailers when necessary. No matter what the job there is a Mercury equipment to handle it.

Sears Roebuck & Company
Illinois Central Railroad
Miller Rubber Company
New York Central Railroad
United States Government
Goodyear Tire & Rubber Co.
Morris & Company
Studebaker Corporation
Trumbull Steel Company
Philadelphia & Reading R. R.
Sugimura Warehouse (Japan)
Compania Terminal Atares (Cuba)



THE FAMOUS MERCURY "L-TWIN" TRACTOR

Digitized by Google

(*Continued from page 41*)

The construction of this cinder catcher is simple. A sheet-steel baffle plate, over which water is constantly flowing, stands in the way of the smoke coming from each of the 146 boilers; as the cinders in the gases or smoke hit the baffle the water carries them to the bottom of a horizontal tube from which they are washed into a scow every 24 hours. It is worthy of note here that the process of removing ashes at Waterside, also, is entirely automatic. From the fire beds the ashes drop into hoppers which in turn are emptied into collectors drawn by storage battery locomotives. These cars deposit the ashes into a pit, from which a conveyor lifts them to a storage bin from which they are dropped into dumping scows.

Our digression from the immediate process of putting coal on the wire was at the point where a battery of boilers, aggregating 95,000 horse-power, daily converts 2,500 tons of coal into sufficient steam to drive what is probably the most powerful battery of turbine generators in America. There are ten turbine generators in each of the two buildings at Waterside, one building housing: one 31,000 kw. horizontal, one 22,000 kw. horizontal, two 14,000 kw. vertical, and six 12,000 kw. vertical, and the other holding: two 35,000 kw. horizontal, three 20,000 kw. horizontal, three 9,000 kw. horizontal and two 7,000 kw. The operation of the turbine generators in each building is directed from a gallery extending into the generating room and affording an unobstructed view of each machine. The two plants are operated as a single unit under the control of the System Operator.

The turbine generator is the point at which coal, in the form of steam is actually placed on the wire as electrical energy. But the current which comes from the generator is not quite ready to light your lamps or lift your elevators. Before it is ready for distribution to the consumer, it must first pass through three distinct channels, each a cog in the big central station machine as important as the generation of the current itself. These channels are: first, the cables carrying the current at high tension to the 38 distributing or sub-stations; second, these stations, themselves, whose job it is to transform the high tension alternating current into direct current at low voltage; third, the intricate system of street feeders and mains by means of which the "juice" is conveyed to the lines which run into the consumer's premises.

A word about each of these channels. Cables from the turbine generators conduct the current, which at that stage is either 6,600 or 11,000 volt stuff, through three single-phase reactors; these are huge safety devices to limit or restrain the high tension current in the event of a short circuit. From the reactors the current is carried through a series of oil circuit breakers to the great busses or "carry-alls" on which are hooked the lines that carry the current to the sub-stations.

The current, received by the



"Mercury" Proud of Timken Bearings

Timken Tapered Roller Bearings are standard equipment in Mercury industrial tractors.

In a letter to The Timken Roller Bearing Co concerning the installation of Timken Bearings in their product the Mercury Manufacturing Co. says:

"Your product has stood up exceptionally well in the hard service which our tractors are forced to undergo.

". . .We have always been proud to point out that our bearings are 'Timken Tapered Roller'.

"Our customers and prospects have accepted our bearing specifications with full confidence and without question."

Here is sharp realization of the fact that in addition to their efficient performance Timken Tapered Roller Bearings are a distinct sales asset to any product in which they are installed.

The Timken Roller Bearing Co
CANTON, OHIO

TIMKEN Tapered ROLLER BEARINGS

—Will Also Save Power and Money in—

Blowers and Compressors
Clay Working Machinery
Cranes
Dairy Equipment
Electric Motors
Electrical Machinery
Elevator Drives
Farm Lighting Units
Gasoline Rail Cars
Gas Motors
Gas Producers
Grain Milling Machinery
Grinders
Hoisting and Conveying Machinery
Industrial Tractors and Trucks
Laundry Machinery
Lawn Mowers
Machine Tools
Mine Cars
Mining Machinery
Oil Well Machinery
Paper Making Machinery
Power Transmission Machinery
Printing Presses
Pumps
Railway Equipment
Refrigerating Machinery
Road Making Machinery Wheels
Separating Machinery
Shoe Machinery
Steel Mill and Foundry Equipment
Stokers
Street Railway Cars
Street Sweepers
Textile Machinery
Tire Making Machinery
Ventilating Machinery
Wood Working Machinery

—and Wherever There Is Friction

© 1922, T R B Co, Canton, Ohio

Digitized by Google



We Ought to Know

We've spent over thirty years building tanks for all sorts of uses. Our engineers, designers and workmen are constantly thinking tanks. Our products are living up to their reputation in all parts of the country.

The Caldwell Steel Tank is like our other products in that it reflects all the excellence of character that such experience produces. You can rely upon it for unusual performance.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook St. **Louisville, Ky.**

Caldwell TANKS AND TOWERS

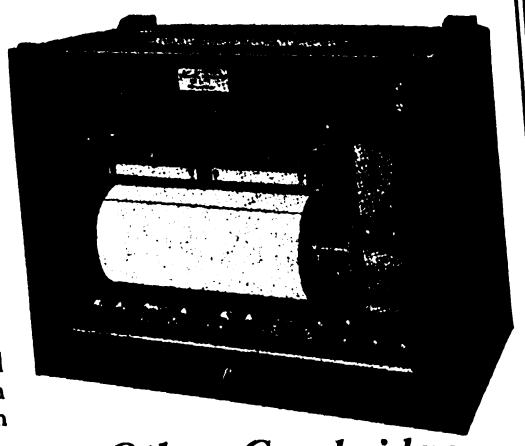
CAMBRIDGE ELECTRICAL CO_2 RECORDERS INDICATORS

Accurate Boiler Room Records

without the use of rubber, glass or chemicals, will prove a boon to your operating man in the power plant.

The Cambridge CO_2 Recorder-Indicator is entirely electrical—Accurate and Rapid in action and can be placed any distance from the flue.

Low in Maintenance Cost.



Send for List No. 157X

Other Cambridge Instruments

Electrical Distance Thermometers
Resistance Pyrometers
Thermo-electric Pyrometers
Optical Pyrometers
Radiation Pyrometers
Electrical Instruments
Physical Instruments

The Cambridge and Paul INSTRUMENT Co. of AMERICA (INC.)
Works Ossining-on-Hudson NEW YORK Office & Showroom Grand Central Terminal

sub-stations at 6,600 or 11,000 volts is passed through transformers which bring it down to 200 volts, then through rotary converters which reduce it to low tension or 120 volt direct current. Each sub-station is equipped with a storage battery installation capable of carrying the entire load of the station for a period of from five to seven minutes, though the emergencies for which the storage batteries are provided rarely extend over one minute.

Just as only a handful of consumers—the city high pressure pumping station, an electric railway system, and the large industrial plants using high tension current—receive their power direct from the generating station, so only the large department stores, office buildings and the other heavy consumers of direct current are served direct from the sub-station's switchboard. The lines which provide light, heat, and power, for the great mass of The New York Edison Company's customers are connected to underground mains which in turn are fed from the street feeder boxes located at strategic intersections, the feeder boxes receiving current direct from the sub-stations. The feeder box system does two important things: reduces greatly the mileage of underground cables, and facilitates automatic equalization of the voltage in cases of breakdowns or sudden changes in the consumption of current.

The nerve center, not only of the Waterside plant, but of the entire New York Edison Company system is the System Operator's Room at Waterside No. 1. Upon the System Operator rests the responsibility for the maintenance of service to the sub-stations throughout the city. He must anticipate every demand for service and give the orders which will enable the system to meet it. On the big board before his desk colored lights indicate the condition of every generator and every transmission line; meters show the capacity of the entire system and the current transmitted on the various feeders; a gauge shows the boiler pressure. Behind him a wireless gong signal apprises him of approaching storms and their accompanying darkness long before a cloud is in sight from

(*Continued on page 46*)

"The Reeves"

VARIABLE SPEED TRANSMISSION



Installation of a No. 6½-E REEVES Transmission operating stoker shaft at New York Edison Co.

Variation of speeds easily and quickly obtained

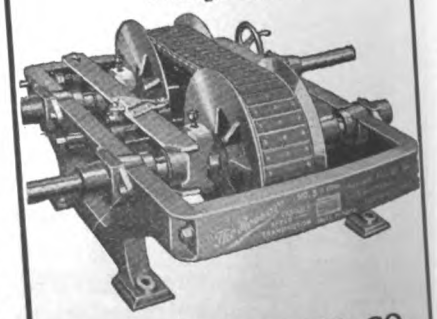
Application to stokers in lighting and power stations makes it possible to anticipate heavy loads and to take care of sudden "peaks."

By regulating the speed of stokers through "The Reeves" Variable Speed Transmission, precisely the right amount of coal is fed into the furnace at all times, assuring perfect combustion and securing the greatest amount of heat units per ton of coal.

A slow or normal fire can be maintained until there is a call for more power, or when a dark storm is approaching, then the speed of the stoker is increased by means of "The Reeves" Transmission, until the proper amount of coal is being stoked to produce the necessary power.

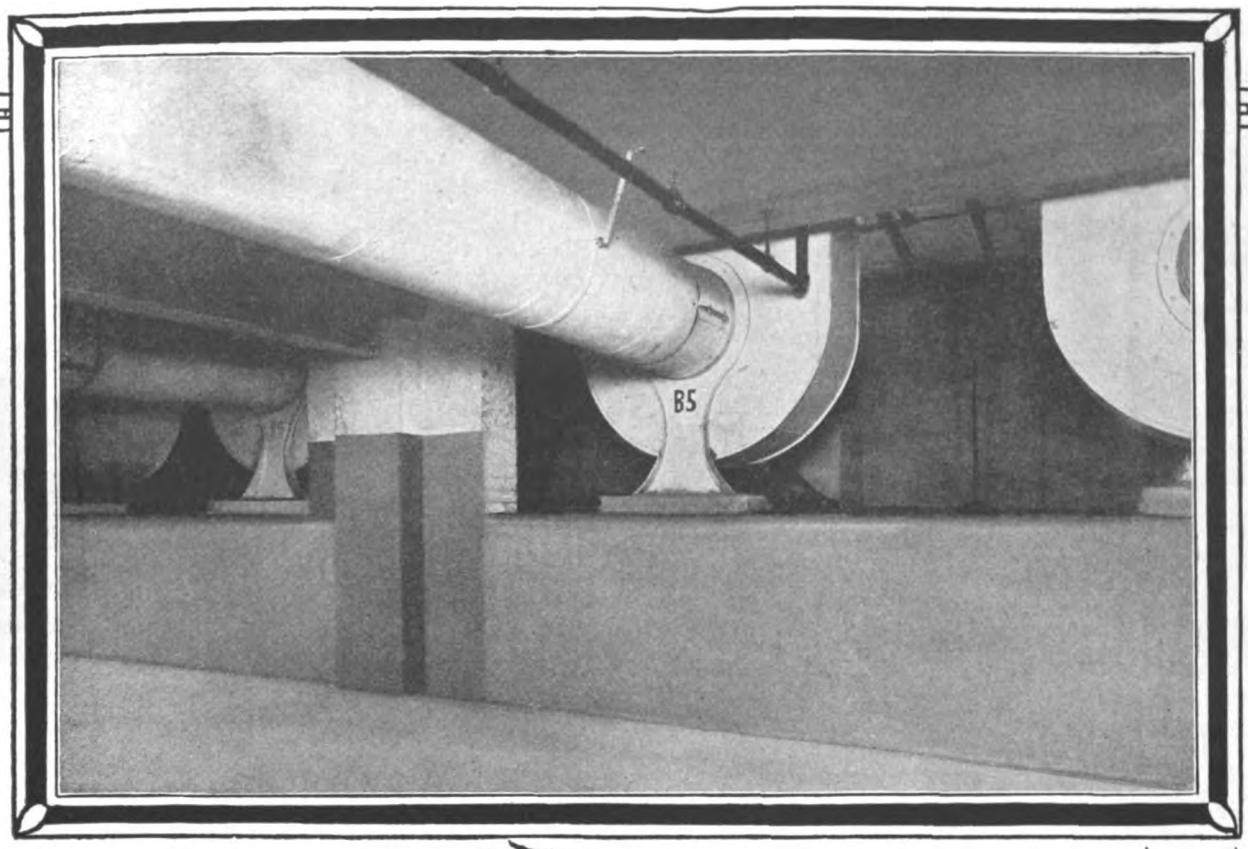
The original installation of "The Reeves" Transmission made with the New York Edison Company was in 1912. This machine was subjected to a rigid experimental test, which proved that it effected such great saving in coal that it paid for itself in an incredibly short time. The performance of this machine has resulted in the installation of a great number of REEVES Transmissions with this company.

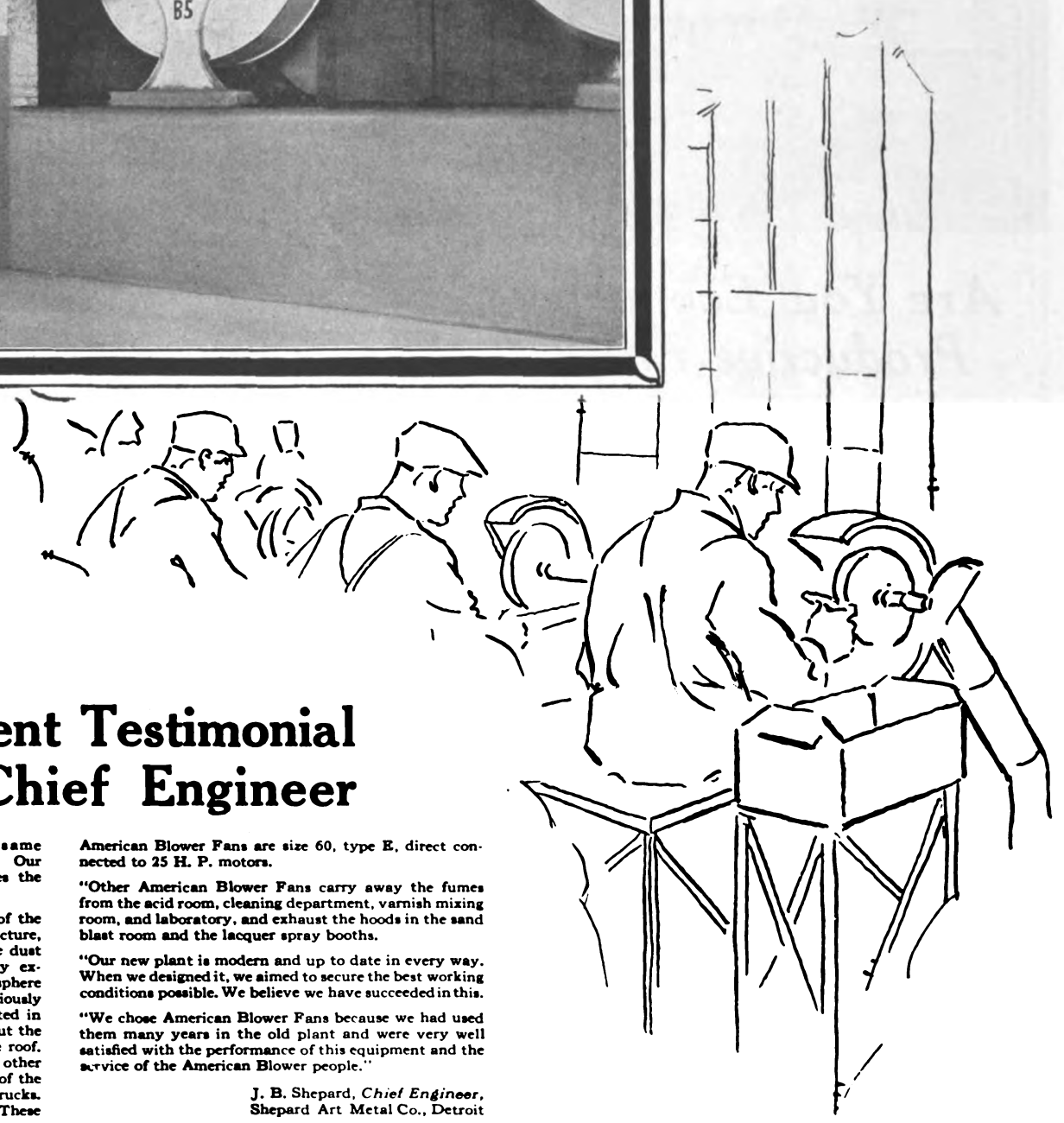
Write for our new 52-page catalog, L-44.



REEVES PULLEY CO.
Columbus, Indiana

Digitized by Google





An Eloquent Testimonial From a Chief Engineer

"When 256 polishers are working in the same room, the problem of removal is a big one. Our American Blower Equipment, however, does the work perfectly.

"For putting a high polish on the plated parts of the articles of automobile body hardware we manufacture, we use polishing wheels and emery powder. The dust arising from this operation must be completely exhausted, because if it should enter into the atmosphere breathed by the men, their lungs would be seriously effected. Our eight American Blower Fans, located in the basement, below the Polishing Room, draw out the dust and force it into four dust collectors on the roof. From these dust collectors, it is blown by two other American Blower Fans to a collector at the rear of the building, from which it is hauled away by motor trucks. Three motor truck loads are taken away per week. These American Blower Fans are size 60, type E, direct connected to 25 H. P. motors.

"Other American Blower Fans carry away the fumes from the acid room, cleaning department, varnish mixing room, and laboratory, and exhaust the hoods in the sand blast room and the lacquer spray booths.

"Our new plant is modern and up to date in every way. When we designed it, we aimed to secure the best working conditions possible. We believe we have succeeded in this.

"We chose American Blower Fans because we had used them many years in the old plant and were very well satisfied with the performance of this equipment and the service of the American Blower people."

J. B. Shepard, *Chief Engineer*,
Shepard Art Metal Co., Detroit

American Blower Engineers will cooperate with you in the selection of equipment for exhausting, heating, ventilating, mechanical draft or any similar purpose. Write for bulletins on any of the above subjects.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO

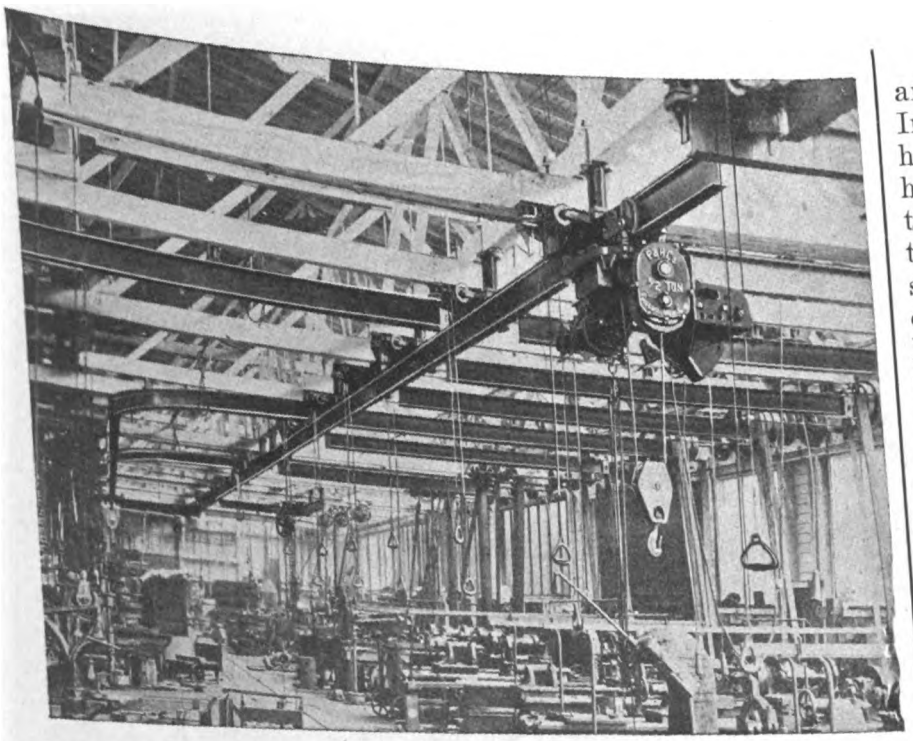
(244)

American Blower

"Sirocco" TRADE MARK

EXHAUSTERS · VENTILATING FANS · AIR WASHERS · BLOWERS · ENGINES
FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

Digitized by Google



Are You Economizing on Productive Floor Area?

You can make greater use of available floor space, decrease the aisle areas—and at the same time reduce your common labor costs by means of P & H Overhead Hoist and Monorail Systems.

In the installation shown above—at the Summer Iron Works the P & H eliminates hand trucking and speeds up the carrying of material from one machine or location to another.

The Hoist travels on the main track or on spurs—pivoted I-beam sections being placed at intervals to allow the Hoist to give service wherever required.

This installation has been pointed out by a material handling engineer as typical of modern labor saving methods. There is no loading and unloading of trucks traveling over valuable floor space—no unnecessary gang of laborers.

The same quality of design and construction found in P & H Traveling Cranes, is applied to P & H Hoists. Long life, low maintenance, accessibility and dependability are the result.

P & H Electric Hoists and Monorails can relieve you of labor problems, and help care for increased production. It costs you nothing to let us look over your shop layout and give you an estimate on your requirements.

Readily Installed in Existing Buildings

You can equip your present buildings, sheds, or yards with P & H Hoist and Monorail System at once, extending their use at any time. Hoists of various capacities, floor or cage controlled, can be applied depending on the work to be accomplished.

As the major or as auxiliary to traveling crane service, the P & H Hoist with its superior rugged design and construction, and its low maintenance will earn its cost in a short time.

These Features Mean Better Hoist Service—Lower Maintenance

P & H Hoists have these outstanding features—all important from the users' standpoint:

Simplicity—accessibility—rugged control—spur gear transmission with hoist gears running in oil.

Crane and Hoist Division

PAWLING & HARNISCHFEGER CO.

Established in 1884

3850 National Ave., Milwaukee, Wis.

New York, Pittsburgh, Phoenix, Los Angeles, Salt Lake City, Chicago, Philadelphia, Denver, San Francisco, Portland, St. Louis, Birmingham, New Orleans, Seattle, Atlanta

P&H HOIST AND MONORAIL SYSTEMS

(*Cntinued from page 44*)

any point in New York City. Immediately in front of him, at his desk, the System Operator has direct telephone connection with 80 men. At his left, a telegraphic signal system, similar to that used by municipal fire departments, enables him to give any message simultaneously to any four or more —or to all—stations in the system. Through this room, also, the lines of The New York Edison Company are connected with those of The Brooklyn Edison Company, and those of every other big nearby central station. The efficiencies made possible by such a nerve center are patent.

The wireless storm detector is a comparatively recent development. Prior to its invention it was customary at Waterside to have a man stationed on the roof of the building the greater part of the day on the lookout for signs of storms.

Electricity, like light and sound, is not a physical material and therefore exists only so long as the influence of its generating source continues. This condition makes it impossible to store electricity in large quantity for emergency use. At times of light or average load, a steam driven electric generating station naturally has a large share of its boilers banked and a number of its generating units idle. The rapidly moving clouds which accompany a storm constitute the principal cause for sudden increases in the demand for current. A big cloud looms over Manhattan, and a hundred thousand persons push the button. But the storm detector told the System Operator that clouds were headed this way an hour ago, and so the hundred thousand circuits serving more than 3,000,000 persons get their lights instantaneously and as bright as ever.

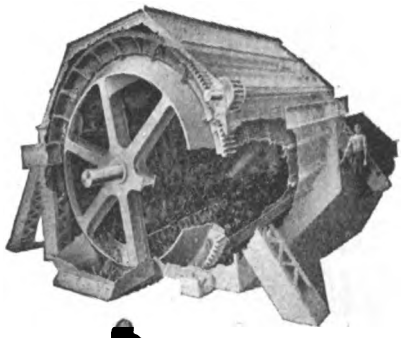
The storm detector is made up of the following parts: an aerial, a short circuiting switch, a spark gap, a coherer, a relay and battery, a condenser, and a ground connection. On page 11 is a diagram of the connection of these parts.

A recent writer in INDUSTRY ILLUSTRATED made the statement that as one goes more deeply into the subject of industrial power plants he is im-

(*Continued on page 48*)

Industry Illustrated

COAL Preparation



"Pennsylvania" Bradford Breaker



WHAT DOES TRAMP IRON DO TO YOUR COAL HANDLING MACHINERY?

"Pennsylvania" Bradford Breakers and Hammer Crushers automatically and accurately pick out the tramp iron during the crushing operation, preventing damage to crushers, and stokers, without extra power or upkeep.

In addition, "Pennsylvania" Bradford Breakers automatically remove the harder impurities including slate, bone, rock sulphur balls and mine props, together with the tramp iron, while preparing Bituminous coal for Stokers, By-Product Coking, Gas Making and preliminary to pulverization for Powdered Fuel Plants.

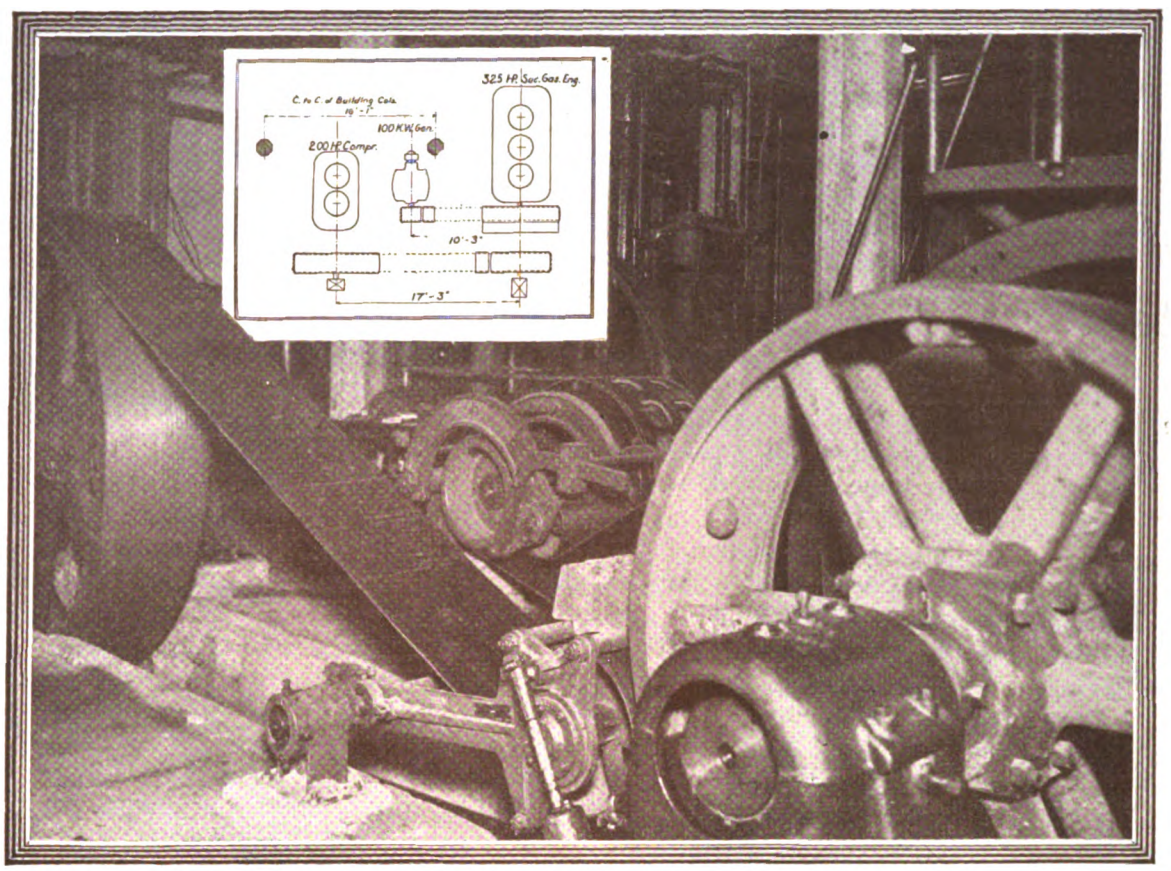
We have brought the right solution to many coal preparation problems, and are ready to cooperate, on receipt of your suggestion.

Send for Bulletin 6001.

PENNSYLVANIA CRUSHER COMPANY

1320-1325 Stephen Girard Bldg., PHILADELPHIA, PA.

Digitized by Google



Another Example of the Advantages of The LENIX DRIVE

Five Points

1—The Lenix increases the arc of contact between belt and pulley.

2—The Lenix maintains, constantly and accurately the proper tension in the slack side of the belt.

3—The Lenix saves floor space, building space and belting because of freedom in pulley locations.

4—The Lenix saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The Lenix permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

The LENIX Drive has solved the problem of this company of co-ordinating a compressor and a 100 KW generator with a 325 HP suction gas engine. The centers are 17′ and 10′ respectively. Thirty feet centers would be required with ordinary open belt drives. Three of such combination units, as illustrated, are installed and operating.

In addition, in the same plant, there is one LENIX on a 400 HP suction gas engine driven compressor and one LENIX on a 60 HP motor driven compressor.

The special design of these LENIXES automatically adjusts itself to all the irregularities in starting the suction gas engines.

The varying power requirements of the compressor and generator may cause one belt to stretch more than the other. The LENIX compensates for the uneven stretch of the belts by automatically taking up the slack and utilizing it to increase the arc of contact between the belt and pulleys, thereby bringing into working contact the hitherto unused surfaces of the belt and pulleys.

Wherever belts are used in power transmission, the LENIX will improve your drive

Booklet "Saving Slippage and Space" describes the LENIX. A copy will be sent on request.

F. L. SMIDTH & COMPANY
ENGINEERS
50 Church Street, New York, N. Y.

The LENIX DRIVE

Digitized by Google

CELITE PRODUCTS

Barriers to Industrial Waste



SIL-O-CEL
PREVENTS HEAT PENETRATION
TRADE MARK REGISTERED U.S. PATENT OFFICE

(*A Celite Product*)

SIL-O-CEL—INSULATING BRICK—prevents heat loss through furnace walls and on all types of high temperature equipment. An effective and economical insulation with an exceptionally low heat conductivity. Easily applied, low in cost; a permanent insulation.



SIL-O-CEL—INSULATING POWDER—less than one-tenth as conductive of heat as an equal thickness of fire brick or red brick. Used between fire brick and steel shells or red brick walls; is sufficiently elastic to absorb expansion and contraction strains; does not settle out or shrink.



CLECOTE—a plastic, bitumastic compound especially prepared for application to the brick surfaces of heated equipment to prevent air infiltration, and also as a waterproofing. It adheres firmly to the brick and mortar, remaining permanently elastic; expanding or contracting with the surface to which it is applied. Celcote will not dry out, become brittle or lose its effectiveness with age.



FRAXITE (High Temperature Cement)—a bonding cement scientifically compounded for setting and facing fire brick work on all types of furnace construction. Furnished in three grades of various temperature ranges. Fraxite prevents fire brick from cracking or spalling, and greatly lengthens the life of the entire refractory structure.

CELITE PRODUCTS COMPANY

ADDRESSES
New York, 11 Broadway
Chicago, 53 W. Jackson Blvd.
San Francisco, Monadnock Bldg.
Montreal, Can., Celite Products, Limited

Gentlemen: Send Bulletin X-6C and explain in detail the advantages of SIL-O-CEL Insulation, how it saves fuel, increases capacity and maintains even temperatures. I am particularly interested in the insulation

of .....
Name type of equipment



Name .....
Firm Name .....
Address .....

(*Continued from page 46*)

pressed with two outstanding facts: the very large amount of capital tied up in power producing machinery and the great number of inefficiencies still existent. The author of that statement had in mind the privately owned or so-called isolated power plant, and his impressions were undoubtedly justified. As one goes through the central station power plant and over its distribution system, two facts stand out: first (as in the case of the industrial power plant) the huge amount of capital invested in land and machinery and, second, many efficiencies made possible by large scale power production or growing out of the necessity for maximum economy which exists in every commercial enterprise.

The strength and scope of the expansion of business activity in this country have been accentuated by developments since the beginning of the year. The usual seasonal slackening in many lines has not appeared at all or has been less pronounced than would ordinarily be expected.

New records for the season in car loadings, the increasing congestion and rising prices in the iron and steel industries, unprecedented activity in the cotton manufacturing industry, intense and increasing activity in other industries—all attest a rate of production and distribution of commodities which surpass most expectations.

Average wholesale prices since the beginning of the year have been fairly constant, with only a slight upward movement, the index numbers showing the same tendency toward stabilization in January that appeared in December. In the case of certain commodities, notably some basic products, considerable increases have been recorded, offset by declines in other prices. It is apparent that, unless the rise in prices of raw materials is checked, further advances in prices of consumption goods may be expected. Resistance to rising costs of living, however, is a factor that cannot be ignored in estimating the probable further increase in prices.
—*The Guaranty Survey.*



Simplicity and freedom from adjustments such that anyone can operate it

THE steam turbine in the smaller sizes suitable for industrial use is very different in its construction from the large complicated units commonly employed by the big central stations. The central station has carefully trained and competent engineers who are nearly as familiar with the design and construction of these intricate steam turbines as their manufacturers. In the industrial plant there is a different state of affairs. The operators have a greater variety of duties and can give less attention to each individual unit. For this reason simplicity and freedom from delicate adjustments has been the keynote of Terry turbine design, as can be seen from its fundamental principle of operation. Instead of a great many wheels, with literally thousands of blades running with very fine clearance, there is but one solid wheel without blades but with pockets or buckets milled in the edge. This construction does not require fine clearance for efficient operation. A gap of one-eighth of an inch exists between the bucket edges and the stationary reversing element. The side clearance is greater than one inch so that careful adjustment of the end thrust is not necessary to maintain safety. If for any reason the bucket clearance should become reduced, the smooth protecting rims at the sides of the wheel would rub on the smooth part of the reversing element, stopping the turbine before damage could result. Write for Bulletin Z-25 which gives a complete description and shows many of the practical industrial applications. Be up-to-date, use turbines, and for simplicity and freedom from worry,

Specify— T-800

THE TERRY TURBINE

Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries



The Terry Steam Turbine Co.
Terry Sq. Hartford, Conn. U.S.A.

Digitized by Google

What *Is* Money?

BY JOHN S. WATTS

WHILE we all use money every day, there are few who have any but the most sketchy ideas of why the notes or coins used as money are accepted by themselves and others in return for their labor, or in payment for goods. The fact of the matter is that practically everyone accepts money in return for value given, simply on faith that this money will be accepted in turn when presented by them to some other person from whom they desire to purchase goods or services. This faith is based solely on past experience that such money will be accepted as having real value, and not, as it ought to be, on a reasoned knowledge of what it represents, or from whence it derives its value. The disadvantages of this ignorance about money are many, the principal ones being that prosperity can be held back by the banks and other financial bodies withholding money from circulation, and that governments can add to the money in circulation without impairing the value of that amount already issued. If our people can be educated to understand where and how money is given its value, they would cease to blame adverse conditions on some mysterious entity which they ignorantly conceive to be lowering the value of their money, and address themselves to correct the real trouble.

For some centuries now, the metal gold has been used almost universally for monetary purposes, and it is probable that it will remain so to be used, as it does not seem possible to find anything that will answer the purpose better, although it must be admitted that it is by no means a perfect standard of values. To gain an understanding of the money question, it is essential that we know just what money is and what it is intended to be and do. A piece of gold money then, be it a dollar, sovereign, franc or mark, is actually a certain fixed quantity of gold of a standard purity, and has therefore a minimum present value equal to the value of that amount of gold at the present market price. It also follows that the gold coinage of any country has a fixed relative value to the gold coins of any other country, and therefore if all countries used nothing but gold coins or their equivalent, exchange values could vary only very slightly.

The ideal monetary unit would be one whose value, expressed in other units would be as stable as are these other units. For example our measures of weights, lengths, capacities, etc., are all exact and determinable, and are mathematically inter-related one to the other; the gallon measure of capacity is fixed at so many cubic inches; a yard is always a yard in length, and a pound weight is the same now as it always was. So also are the engineering and electrical units of power and force fixed scientifically in easily comparable terms of the other units. The unit of value, the dollar, is the only unit that has no fixed value in terms of any other unit or material than gold; that is, a gold dollar cannot be declared truthfully to be equal to a bushel of wheat, or to anything else but a dollar's worth of gold; not so much that the gold varies in value, but because the wheat does vary in value according to its scarcity or otherwise, and according to the wages paid for the labor used in its production and transportation, as do all other commodities and services.

WE must consider now what we mean by the value of a certain amount or quantity of material. It would seem that a bushel of wheat being always a fixed quantity and weight of wheat, and a gold dollar always a fixed weight of gold, the two should be interchangeable on a fixed basis with only minor fluctuations due to temporary maladjustment between supply and demand for wheat; and if all money were actually gold, and the labor entering into its production paid a stable rate, this would be the case. When we speak of the value of anything, we mean the worth of the goods we can get for it, but as everyone does not want the same things at the same time, this value has to be quoted in terms of one thing, namely gold, to which the value of all other things is referred.

A GOLD coin, then, is intended to represent a standard value, and as near as may be a stable value, but it can be demonstrated that gold has acquired a fictitious value; that is, one higher than its real value through and because of its use as money. What I mean is that if gold were not used for money, none would give the same amount of wheat, say, for the amount of gold that is in a dollar that they do now, because the demand for gold would not enable them to exchange it again for anything equal to the value of the wheat.

To make this more clear, let us suppose that all the debt owing to the United States by the European countries is paid in gold. This would leave all those countries outside of the States, without that metal. As it happens that gold is not an essential metal (in the sense that the world could quite comfortably get along without it) it might conceivably occur that Europe after paying its debts might decide to dispense with gold, and refuse to accept it back from the States in payment for goods and services more essential than gold. This action would reduce the value of gold to its intrinsic worth as a metal, which (as its main use, apart from coinage, is in the manufacture of jewelry) would become still less, as an over supply of any material used purely for ornamentation, very rapidly depreciates it in the eyes of those who desirse to display their wealth by wearing rare metals. If gold were as essential as coal, iron or food, the case would be entirely different.

On the other hand gold is the metal best fitted for monetary use, being incorrodible, easily tested, and fairly well distributed over the world's surface in sufficient quantities for the purpose; and yet not occurring in such huge amounts as to cause any fear of its ever being depreciated by the discovery of any immense deposit. So as long as the world continues to use a purely gold coinage, its value would be expected to remain fairly constant. And until paper money began to be used, the value of gold coinage was quite stable. When a country is said to be on a gold basis, we mean that all the money issued in that country is either in gold coins (omitting for clearness the consideration of silver and copper coins) or in paper, against which there is held an amount of gold equal to the face value of the paper. This paper money being redeemable in gold on demand and in full, these certificates are in every way equivalent to gold coins. The original idea in issuing notes was to save the loss due to the wear on the gold by continual handling.

WITH gold money exclusively used, any money issued must represent a real increase in the wealth of that country in this way:— a gold mine, having produced a dollar's worth of gold, sells it to the government and receives a dollar coin for it; the transaction practically amounting to simply converting the gold into coinage, and returning it to its owner. The total wealth of the country has been increased by one dollar's worth of gold, and the money in circulation by an equal amount. But at the same time during which the gold was being produced various other forms of wealth have also been produced, some temporary, such as food and fuel, and others more or less permanent, such as buildings, roads, etc.

We see therefore that on a gold basis, our money will be absolutely sound, but we are confronted by the difficult problem of deciding how much money is needed. We would have to decide how much gold to purchase for coining, some

Digitized by Google

REED-PRENTICE
MACHINE TOOLS
WORCESTER, MASS. U.S.A.

Built by REED-PRENTICE

assures the user of the most practical design and very highest grade construction possible in that particular type machine.

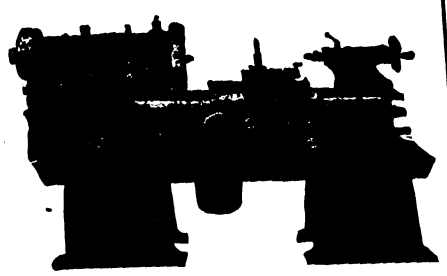
It tells in the unexcelled service the machine renders.

What are your machine tool requirements?

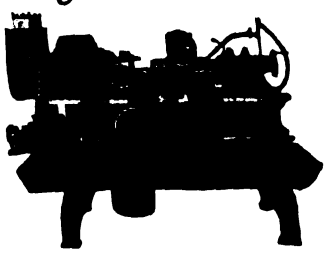
We are anxious to serve you.



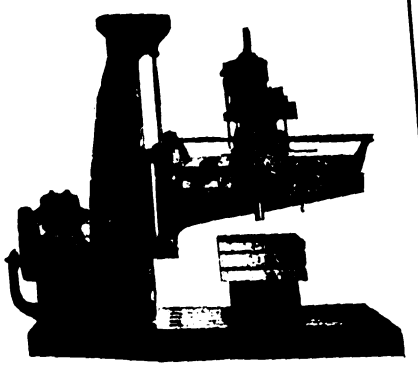
Becker Millers
With the smooth finish
For Engravers and Diesinkers



Reed-Prentice Engine Lathes



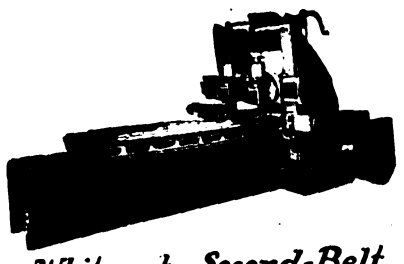
Reed Prentice
Production Lathes



Reed Prentice Radial Drills



Production Milling
Cutters



Whitcomb Second-Belt
Drive Planers

REED-PRENTICE CO.

LATHES-RADIAL DRILLS
BECKER MILLING MACHINES
MILLING CUTTERS



RAPID PRODUCTION LATHES
WHITCOMB PLANERS
SPECIAL MACHINERY

WORCESTER, MASS.
677 CAMBRIDGE ST.,
Branch Offices and Agents Throughout the World

time ahead of the need for the money. If too much is coined the wealth of the country is needlessly tied up in unproductive gold, and if too little, the business of the country would be seriously inconvenienced. This difficulty is overcome by issuing notes and purchasing gold to the value of the notes issued, reselling the gold as the notes are retired from circulation.

The amount of money in circulation in any country can be no criterion of the wealth being produced in that country, nor does the total money in a country represent the wealth of that country, or indeed any fixed proportion of it. The real measure of the wealth of a country is its income, or in other words the value of the goods it produces in a year, over and above the value of what it consumes in gaining this production.

The above should clear up the common fallacy embodied in the phrase that "the world cannot pay its debts because there is not money enough in existence to do so." Our debts are not, in the final analysis, paid in *money*, but in *goods*, and our ability to pay a debt is dependent upon our ability to produce; while the volume of our production is limited only by our intelligence and energy, and by the possession of the means of production—such as land, machinery, etc. If I have a thousand dollars and keep it locked away, I get no income from it. But if I spend the money to purchase machinery which can make some useful article, I will have an income from it and still have the equivalent of the money in the machine; so that if I have not the money, still I am richer, because I have an *income* which, being permanent, is real wealth. The possession of money, then, is not a measure of wealth (except it be potential wealth) but the possession of productive machinery is positive wealth.

Money is only needed to facilitate the trading between producers and consumers, and as money in itself produces no wealth, no one keeps more money on hand than is needed for immediate use; any more money than this that comes in is at once invested in the business of producing—that is, is spent on the means of producing—or left at the bank to be there loaned to others who can use it. It follows that the amount of money needed for circulation in any country is only that to be used for cash transactions, and for the accumulation of small amounts saved out of income until they reach a total sufficient for reinvestment in another productive unit.

The amount of money needed in any community may fluctuate considerably from time to time, and if there were no banks, the currency would be always either too plentiful or too scarce. The banks act as a reservoir, accepting money from those having more than their immediate needs call for, and paying it out to those needing it. Still, there is nothing to ensure that there will always be sufficient money to pay for all the goods that may be offered for sale on any particular day, except the accumulated experience of the bankers as to the demands they may expect. Owing to the fact that most transactions are settled by cheques, the money in circulation covers only a very small percentage of the actual trading being done, and if it were not for cheques, the money in circulation would have to be increased tremendously.

One other difficulty is that which we have when the Western Wheat is harvested and delivered by the farmers to the elevators. Here we encounter a demand for a large amount of money; in addition to that ordinarily needed, and which cannot be satisfied by cheques. Let us see what would result from having sufficient gold coinage to pay for this wheat crop. The farmer generally runs up bills for a year on the strength of his coming crop, and, when this is harvested, pays these bills from the proceeds, and deposits in the bank any surplus. His creditors likewise pay their bills, and deposit a part; and so on down the line, until in a few weeks the money is practically all back in the hands of the banks again.

For about three-quarters of the year, the banks would have more money than they could find work for, and only during the other quarter would all their funds be earning returns.

(*Continued on page 53*)

Digitized by Google

The Voice of American Business



The Voice of American Business is carried by the Dictograph System of Intercommunication.

The only thing between you and and "your man" is the Dictograph key which you control.

More than 50,000 executives in factories, banks, commercial offices, public service corporations, governmental departments—in fact, every line of business—secure 100% results in time and efficiency by using the Dictograph System.

Things that usually take hours are disposed of in minutes over the Dictograph. It makes instant action possible—you get "your man" and your answer ***right away.*** And ***you*** always have the right of way—***executive control.***

You throw the key—sitting in your natural position—and talk—that is all there is to do.

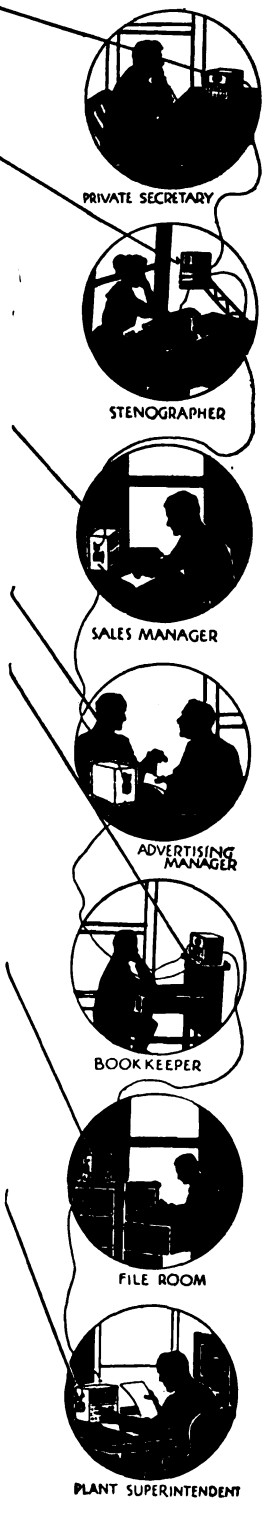
Back comes the answer from "your man," as clearly and distinctly as though he were sitting opposite you.

A telephone operator is unnecessary in the operation of the Dictograph System; there is no unsanitary mouth piece to talk into; the Dictograph System eliminates the necessity of running from one department to another for information; as many conferences can be carried on as there are Dictograph stations without anyone leaving his desk; everybody's time is saved.

Your finger is on the pulse of your business every minute, and every department is in constant touch with the other.

In any business where there are two or more departments between which there is frequent communication, there is a definite need for the Dictograph System.

Check and mail the coupon below; indicate when it will be convenient for you to see the Dictograph in action on your own desk. Also send for a free copy of "An Essay on Executive Efficiency," which analyzes the problems of intercommunication. No obligation to you.



Dictograph Products Corporation

Charles H. Lehman, President
220 West 42nd Street,
New York, N. Y.

Branch Offices in all Principal Cities
Throughout the World

Dictograph Products Corporation
220 West 42nd Street
New York City

☐ **10-Minute Demonstration**—You may give me a 10-minute Demonstration of the Dictograph, with the understanding that it places me under no obligation.

☐ **Free Booklet**—You may mail "An Essay on Executive Efficiency," which analyzes the problems of intercommunication.

Name.....

Address.....

(PLEASE ATTACH TO YOUR LETTERHEAD)

I. I. 3-23

Dictograph Products are *standard of the world.* Among the best known are the Acousticon for the Deaf, the Secret Service Dictograph, the Motor Dictograph for limousines, Dictograph Radio Head Sets, Dictograph Radio Loud Speakers, and the Dictograph System of Interior Telephones for all intercommunication purposes.

Digitized by Google

Power Savings Paid for Two of the Three

A 200 horse power Fulton Diesel was installed in a central power station in 1917. Its power savings soon paid for a second Fulton Diesel, installed in 1919. Savings by these two then paid for a third, purchased in 1921.

The Fulton Diesel—American built, perfected internal-combustion, stationary engine—running on low-grade fuel oil, may be likened to a huge, high-class automobile motor in a power plant. Instant in action, automatic in control, consuming fuel only when in use and maintaining continuous high efficiency with practically no upkeep cost. In addition, it operates on one-third of the fuel required to produce equivalent steam power. A self-contained power unit, it calls for no investment in boilers, stacks, condensers or any such steam plant auxiliaries. One engineer runs it. Fuel handling and waste removal, with all attendant labor costs, are abolished.

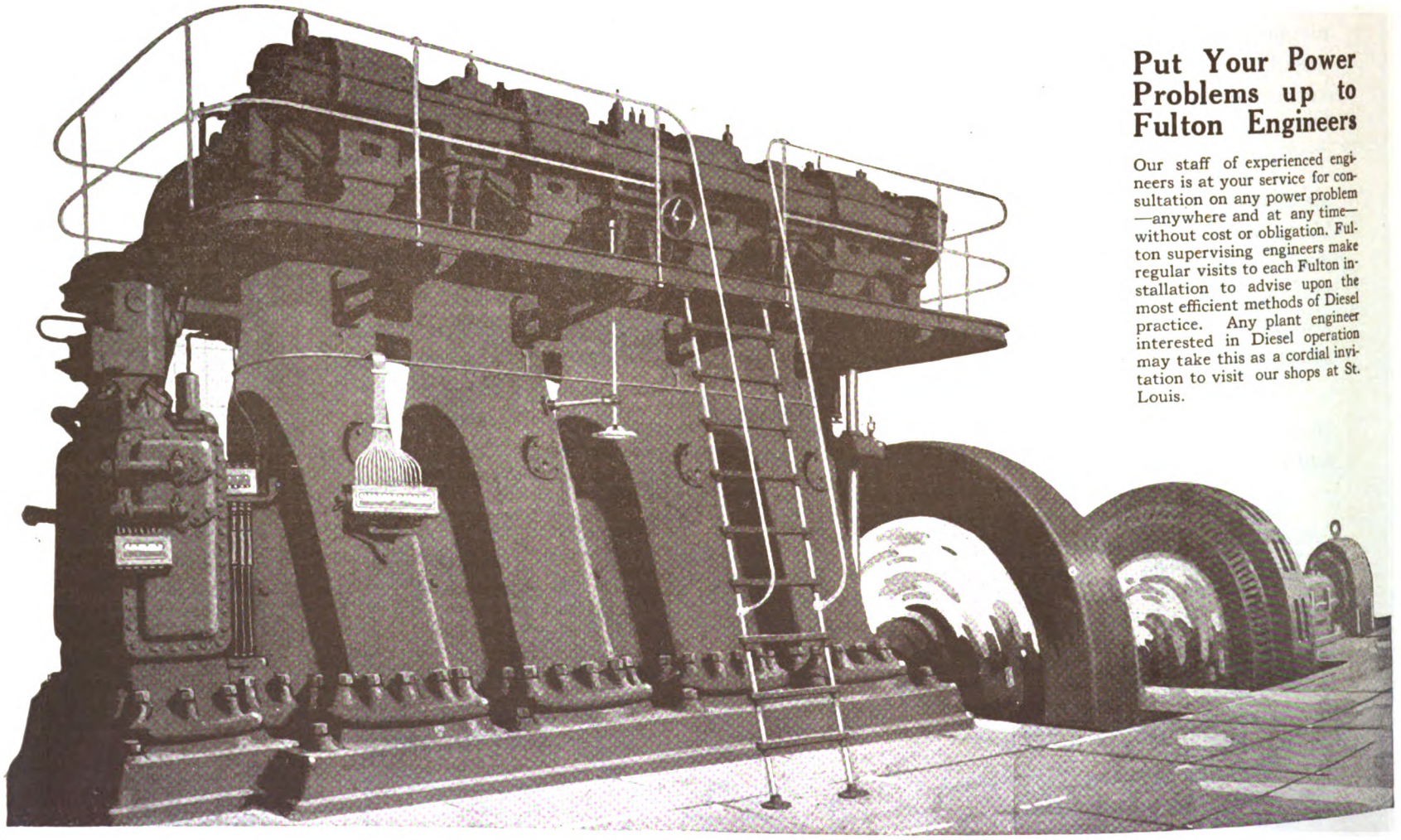
The Fulton Diesel is a development of 70 years' successful experience in engine building. Ten years have been concentrated on perfecting it, and its economy and efficiency stand proved in varying and exacting tests of service. Thus, through its mechanical excellence, the Fulton Diesel is established in the industrial world today as the stationary power producer that saves the appalling cost of power waste.

FULTON IRON WORKS COMPANY, ST. LOUIS, U. S. A.

Successful Engine Builders for 70 years

Branches

New York—82 Wall St. Dallas, Texas—Praetorian Bldg. New Orleans, La.—Hibernia Bank Bldg. Havana, Cuba—401, 402, 403 Banco Nacional.



Put Your Power Problems up to Fulton Engineers

Our staff of experienced engineers is at your service for consultation on any power problem—anywhere and at any time—without cost or obligation. Fulton supervising engineers make regular visits to each Fulton installation to advise upon the most efficient methods of Diesel practice. Any plant engineer interested in Diesel operation may take this as a cordial invitation to visit our shops at St. Louis.

FULTON DIESEL

Digitized by Google

(*Continued from page 50*)

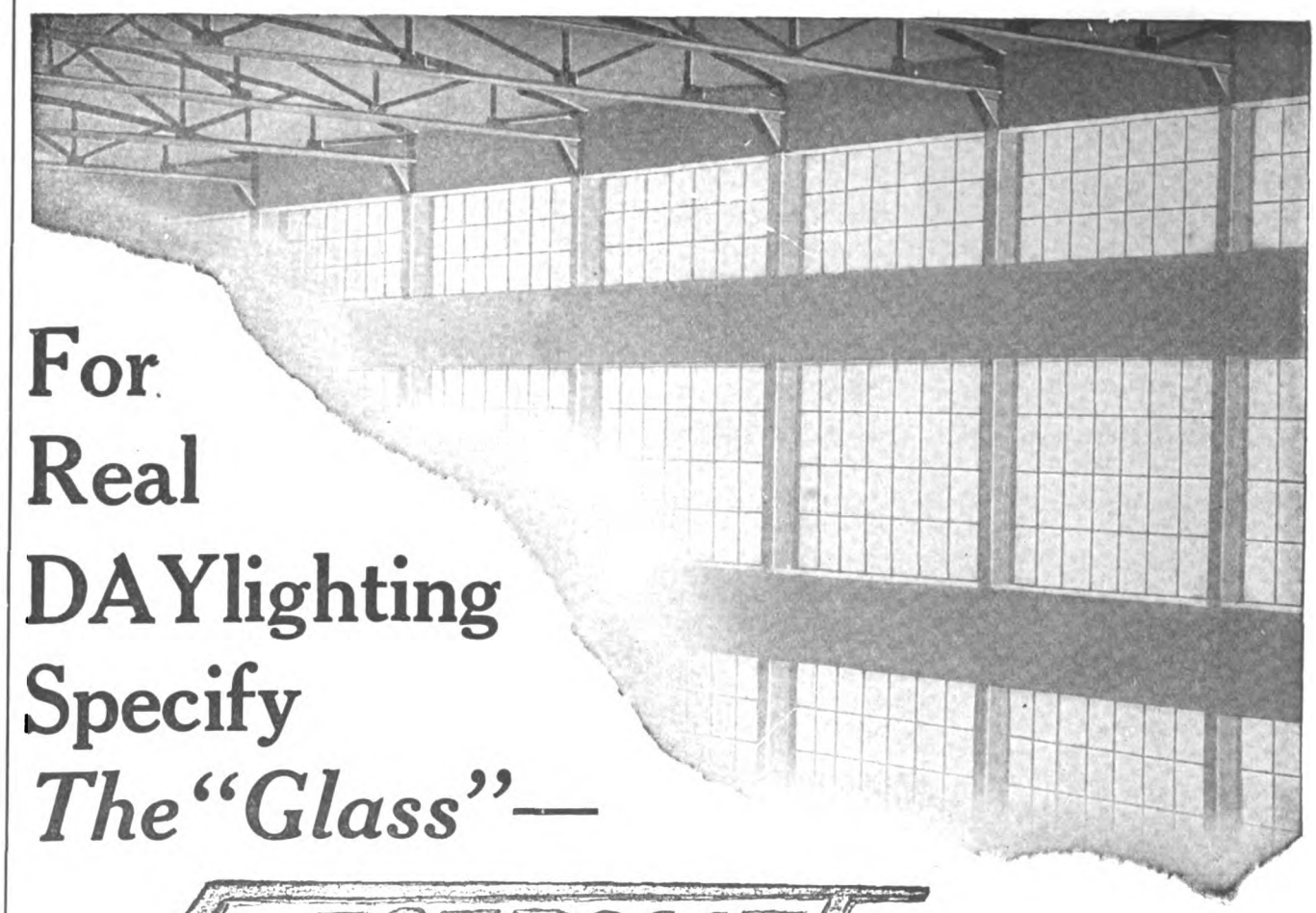
Remember that, from the nature of their business, the banks cannot well refuse to take on deposit all the money that is offered, and if they are compelled to carry a larger liquid reserve, as they would under these conditions, their interest rates would have to be increased to give them an equal return. To avoid having to go into too lengthy detail about this phase, it may be pointed out that it cannot pay in the long run to have more of anything than is required, and to have an excess supply of gold coinage simply ties up a part of our wealth in gold, which would be better employed in something that will reproduce itself. The point is that instead of buying more gold, we retain the goods which would have had to be sold for it, and use them to increase our production.

The peak demand for currency is met, in Canada, by permitting the banks to issue more notes than they have gold to pay for. These notes are, in essence, promissory notes or I. O. U's, depending for their value on the credit of the bank or government issuing them. Because they are in no way distinguishable from the notes backed by gold to their face value, their tendency once issued, is to detract from the value in gold of the whole note issue. However, if the amount of money represented by these unsecured notes is not too great in proportion to that backed by gold, and not more than the credit of the issuing party can support, the depreciation of the total issue will be slight, and the damage done less than that which tying up an excessive amount of gold would cause.

Let us now see what happens when a bank issues notes in excess of its gold reserve. In effect the bank purchases a quantity of wheat, paying for it with its I. O. U., which is in turn handed by the farmer to his creditors, and so on. Now in the example, the notes issued by the bank, are backed by the wheat taken as security, and the bank necessarily gives up its title in the wheat when the money so advanced is returned, and matters are as they were before; the additional money issued having been retired as soon as the purpose for which it was issued has been accomplished.

If the unsecured money is *not* retired, the effect will be that the total currency will be depreciated, and will eventually reach a state of stability where the total currency will have a value equal to that of the gold which is available to meet it, plus an amount dependant upon the credit of the country of issue. The latter, in turn, is rated from a consideration of its productive powers. It follows that if a country continues to issue more and more paper without increasing its gold reserve, the paper will fall in value, the total value of the paper money issued remaining practically stationery.

The situation is analagous to what I would be in, if having a hundred dollars, I purchased two hundred dollars worth of goods, paying half



For Real DAYlighting Specify The "Glass"—

FACTROLITE

By **reflection** from the plane surface of ordinary glass a great deal of daylight is lost. The prismatic surface of FACTROLITE **GATHERS** these daylight rays that are ordinarily lost (particularly in confined locations where light strikes the panes at a narrow angle) and **diffuses** them indoors.

When direct sunshine strikes on windows glazed with "FACTROLITE," the workers do not have to work in a blinding glare or to hang blankets or shades to check the sunlight. FACTROLITE gives perfect diffusion that eases eye strain on the workers nearest the glass and gives those deep in the building interior a clear **diffused** daylight to work in.

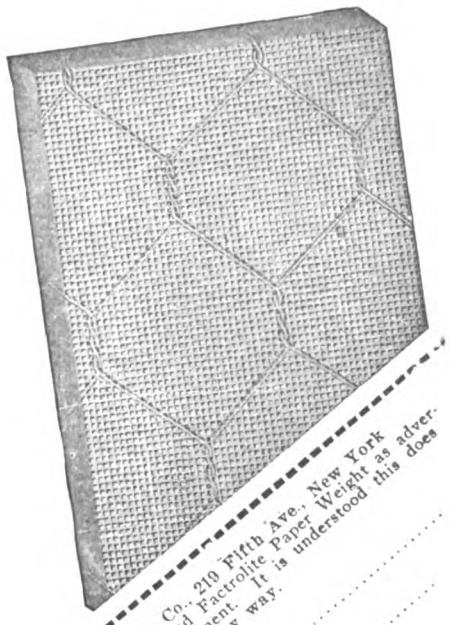
The U. S. Government recently used over 100,000 square feet of "FACTROLITE" for daylighting a huge building 300 ft. x 700 ft. The engineers tell us that you cannot see a shadow in any part of the big structure.

FACTROLITE is made both in plain and wire glass. Test FACTROLITE in your own laboratory.

A free sample will be sent to engineers who use the coupon.

Mississippi Wire Glass Company
219 Fifth Avenue, New York

CHICAGO ST. LOUIS



Mississippi Wire Glass Co., 219 Fifth Ave., New York
Gentlemen: Send me a Catalog and Factrolite Paper Weight as advertised in Industrial Management. It is understood this does not obligate me in any way.

Name.....

Address.....

Digitized by Google

Uhl Steel PosturChairs Increased Production 10%

for some workers in a Boston publisher's bindery. Fatigue is decreased by the perfect adjustment possible with this chair to the individual seating condition.



There is only one right way to sit. The seated skeleton tells the story.

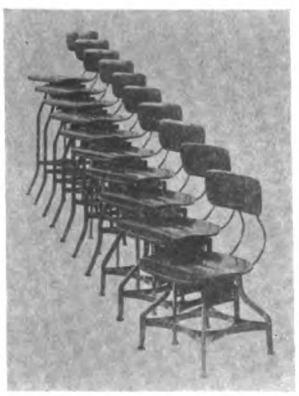
The PosturChair is designed to fit the seated body. It encourages good posture and makes it the comfortable position. It has been designed by experts in seating. It is approved by a nationally known health organization—the American Posture League, and each chair bears its label.

It is a piece of production machinery and as such is being adopted by large employers of labor everywhere.



This chair supports the body where support is needed and eliminates preventable atigue.

Special Features: Made of cold rolled steel except seat and back support which are of wood. 10 heights, each with 3" height adjustment. Seat tilts forward or backward. Back support, swivel and adjustable in height. Durably constructed, neatly finished.



There is a style and height to meet any working condition.

TRY ONE AT OUR RISK

If you are seeking more production and greater health protection for your workers, write us for a sample to try under your own conditions. It's free for two weeks use. Mention height needed. Descriptive pamphlets available.

The Toledo Metal Furniture Co.
1600 Hastings St. Toledo, O.

Manufacturers of steel equipment for factories, stores, offices and schools.

cash and half in notes. For this transaction if my credit is good, I would expect to get a full or nearly full two hundred dollars worth of goods. But if I purchased another two hundred dollars worth, paying again with my note, I would find that my custom was not so desirable, and would certainly find that the second two hundred dollars would not purchase as much as the first, and if I continued this process for long I would reach a stage where my note for two hundred would buy me no more than a loaf of bread. Evidently then, while it may be necessary at times to use our credits, it is safer and more desirable in every way to keep on a cash basis.

Consider now the common remark that there is a scarcity of money and that if it were more plentiful there would be more business done and work enough for all. Some of the radical labor element particularly contend that bad times are induced if not created by money being withdrawn from the market. The fallacy of this has been proved often, and is only mentioned here to make the article complete, and if possible to make the matter clearer. The "scarcity of money" story is started by a man or company who desire to start a business, or increase one, in which they see prospects of profit for themselves. To do this it is necessary to purchase equipment, and not having sufficient money of their own, they try to borrow some. Now the amount of money that is idle and looking for profitable employment does fluctuate considerably, and at a time when money is plentiful (that is, idle money) its owners are not so careful what they invest in as they are when little or no idle money is looking for employment, and this condition has given some similitude to the "scarcity of money" excuse. The essential fact is, however, that the world has produced and owns at any given moment, only so much productive machinery, and if this is all working no more can be had for any purpose, no matter how worthy it may be. Further, whatever machinery or goods may be then in course of manufacture will, in times of such se[illegible]evitably be sold to t[illegible] who, hav-

Powell Valves

Backed by 75 Years Experience

Powell Triple Acting Valves automatically close when a tube bursts —isolating the boiler.

POWELL WHITE STAR VALVES

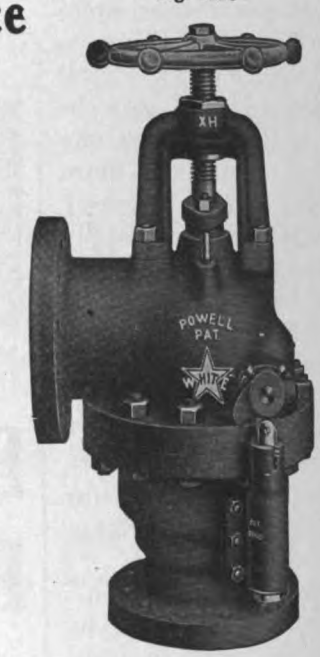
are a combination of the most serviceable mechanical factors insuring to the user unfailing dependability.

Two reasons for their long life are their regrindable, renewable disc, both cast of Non-Corrosive Powellium Nickel.

Medium and extra heavy for steam working pressure up to 200 and 300 pounds.

SEND FOR DESCRIPTIVE CIRCULAR

Fig. 2228



The Wm. Powell Co.

2525 SPRING GROVE AVENUE CINCINNATI, OHIO

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width	$10.68
9½ " "	11.93
11½ " "	14.00
12¼ " "	15.45
13 " "	16.00
14 " "	17.59
15 " "	18.84
18 " "	22.00
18¼ " "	22.90
24¼ " "	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. *Our Customers will benefit.*

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company

(An Independent Corporation)

ROCHESTER, N. Y.

Digitized by Google

ing the best propositions, are best able to pay for them; or, what is the same thing, those whose credit is best.

We come now to the final phase, the fluctuating value of money measured in the amount of goods which it will purchase. The value of any material is the value that is given to it by the labor spent upon it in finding the raw material, manufacturing, transporting and selling it. Even gold itself, our unit of value, is of no value until it has been discovered, and only reaches its full value after it has been mined, smelted and delivered to its market. The relative value of all materials or goods, is in reality the relative value of the labor used in its production, including of course the labor used in the manufacture of the machinery necessary for producing this material.

Over a limited period of years during which no serious disturbance has occurred, an hour's labor, of a certain class, can be shown to have had a fixed value measured in goods such as food and clothing. To have common labor it is essential that such labor be paid enough to live on and propagate, otherwise we should soon have none. And to encourage the learning of a trade, the higher skilled worker must be paid enough more to make the acquisition of this skill desirable. Whether the unskilled laborer produces as much value as he receives, is another question which does not affect the present subject.

Coming right down to the basic, elemental factor, if we could use an hour's labor as our unit of value, we would have a really stable unit; the cost and hence the value of all materials, as we have seen, being really the cost of the labor spent upon it. Of course the standard of living has been raised, in comparison to what it was, and probably will continue to be, but this increase in the goods paid to labor, has been attained by the use of machinery which has increased the income of the world. Labor, by the use of machinery and under skilled direction, has been enabled to produce *more* value per hour per man, and has shared in this increased production.

As all wealth is produced by some form of labor, skilled and unskilled, manual or mental, it follows that in exchanging what we have produced for what we need, we are really trading in labor, and if we paid (that is, valued) a week's labor at $15.00 ten years ago, and increase this to $30.00 now, we would expect to find that $30.00 will purchase to-day no more than did $15.00 ten years ago—namely, the amount of goods equivalent to a week's support of a laborer at the then ruling standard of living.

This is evidently true in a general way, after allowing for the effect of other factors, such as an increase in the standard of living, permitted by increased production per man, inflation of the currency, and the increase in the percentage of a man's production absorbed by taxation. The point I wish to make is that an hour's labor is the real measure of values, and that all other values are automatically regulated by that factor.

Turn the Overhead of Useless Work into Actual Profits!



The Lift in Less Space



Lewis-Shepard Stacker
The Perfect Portable Elevator

Appalling Labor Wastage,—Due to Old Fashioned Handling and Rehandling of Goods and Materials

Live Facts show Labor Cost will continue increasingly to be the most expensive item of production in American Industry

In many concerns 20 to 50% of the Labor Cost is confined to so-called "Cheap Labor,"—engaged in handling and rehandling Goods and Materials—usually in cumbersome, antiquated fashion. These conditions form one of the main sources of the rapidly rising tide of Waste Labor,—a Waste not only appalling, but unnecessary,—BECAUSE

Adoption of Proper Handling Equipment Turns Large Part of Present Labor Overhead into Actual Profits!

Twenty-four concerns increased profits over $59,000 in first year. In fact, *correct handling* equipment does far more than cut down the unskilled workers who now push, tug, shove and lift at heavy, bulky or fragile materials. The best modern handling equipment also increases storage space—floor and operating space—reduces breakage and spoilage; speeds production; and makes inventory and other business routine much more simple and accurate.

Lewis-Shepard Handling Equipment Saves Man Power and Money

by the simple but effective method of giving labor the most efficient tools to work with,—thus eliminating useless effort and slack schedules.

If you would cut down the overhead of useless work—if you would turn this overhead into actual profits—investigate *at once.*

LEWIS-SHEPARD HANDLING EQUIPMENT

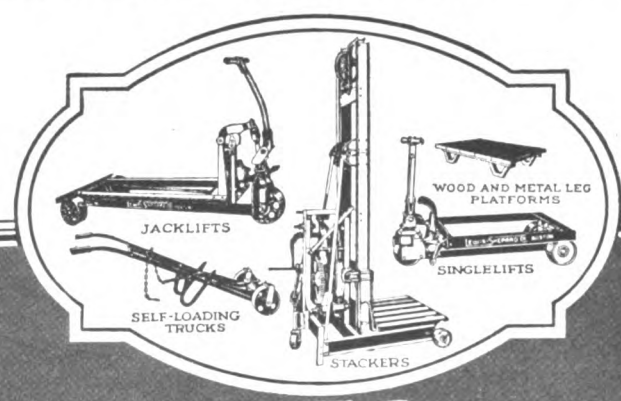
We Guarantee Results from Our Equipment Before You Pay

Not expensive. Over 4000 customers in past eight years. 50% New Business from Old Customers proves that NEW Opportunities for *Saving* follow the installation of Lewis-Shepard Handling Equipment.

Send for Our Free Illustrated Booklet

"24 Users Increase Profits $59,565.88 Yearly"

Write us today
at our Factory Address
Lewis-Shepard Co.
582 E. First St.
Boston, Mass.



Write us today
at our Factory Address
Lewis-Shepard Co,
582 E. First St.
Boston, Mass.

Lewis-Shepard BOSTON

Digitized by Google

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Control



If a sense of "feeling" ruled the Rubber Industry!

Suppose that raw rubber, taken from the initial softening vats was judged for pliability entirely by its "feeling" instead of workmen's knowledge that the time of soaking and the water temperature was correct! Suppose that after passing through washing mills and rollers it was taken from the drying rooms when the men "judged" it was dry enough —instead of the time and temperature being exactly regulated! Suppose the results of the great kneading mills was guessed by feeling, instead of further exact heat control. Or that vulcanization —that all important process—had accurate heat control let out and the elasticity or hardness of the vulcanized product had to be judged by sense of touch alone!

Truly, our rubber belting, automobile tires, rubber heels, moulded goods, combs, fountain pens, buttons, insulation, baloons, matting, storage batteries, and some thirty thousand other rubber products would be undependable and their life and usefulness an unknown quantity!

But sense of touch alone does not rule in the "bakeshop" that is really the modern rubber factory. Into the rubber industry enters that vitally necessary "sixth sense"—Temperature Control—supplied by the accuracy of *Tycos* Temperature Indicating and Recording Instruments. In great rubber factories everywhere *Tycos* Temperature Instruments are accepted as the standard of accuracy.

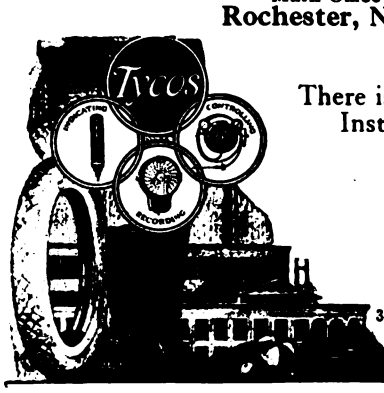
Manufacturers

What do you make? What is your problem of applying the "sixth sense" to your processes? For every purpose of heat control—in any industry—there is a type and style of instrument in the *Tycos* line, embracing as it does over eight thousand varieties.

Write us, and literature on any instrument or type of instrument will be sent you promptly. And our experts will advise you in its application in your plant.

Taylor Instrument Companies

Main Office and Factory
Rochester, N. Y., U. S. A.



There is a *Tycos* or *Taylor* Temperature Instrument for every purpose.

Canadian Plant
TYCOS Building,
Toronto, Canada

Tycos Temperature Instruments
INDICATING · RECORDING · ING

Power Generation at River Rouge

(*Continued from page 23*)

stack, is hung upon the structural steel of the building, the total weight per unit thus supported being close to two and a quarter million pounds.

These boilers are under what one might term automatic control. Situated near each boiler is a three-panel control board, the center panel of which contains gages and recording instruments; the outer panels containing push-button control led rheostats for altering the speed of coal feeder motors, for closing or opening draft dampers, etc. By means of the instruments on this panel and of CO_2 recorders and feed water meters situated nearby, the one "fireman" or boiler operator assigned to each boiler knows exactly what is going on in all parts of the boiler at all times. By means of the push-button controls with their "start," "stop," "slow and fast" positions, he is able to adjust conditions to suit the load, merely by pushing a button or two.

Nine-tenths of the air necessary for combustion is introduced into the combustion chambers through hinged inlet doors which are opened according to required draft conditions. There is no escape of heat from these furnaces to the boiler house; in fact, steam radiators are provided to keep this boiler house warm in winter in spite of unusually tight and well insulated building construction. This in addition to the average stack temperature of 550 degrees speaks well for the absence of such heat losses.

Enough water is evaporated by these boilers daily to flood an area of two and one-half acres to a depth over two feet.

Approximately nineteen per cent of this total evaporation is not recovered through condensation, being lost in its use for process heating in various parts of the plant. To make up this deficit, distilled water is provided at the rate of 1380 tons a day. This is known as the "make up."

The department in which this huge quantity of water is distilled daily is known as the "evaporator room," and is situated directly over the blower room. The chief feature in this department is the double battery of evaporators or stills, nine in a battery, arranged in upper and lower groups, forming what is called "a double effect" evaporating system, the vapor distilled in the first effect group being used to heat the evaporating coils of the second effect group. In these stills the raw water deposits its impurities before going to the hot well. Before entering the double effect, however, its mechanical solids have been largely eliminated and the temperature of the Rouge water considerably boosted by having passed through a series of preliminary screenings and heatings.

From the hot well, water as required is drawn by means of three feed water pumps through open heaters on the suction line. It is then delivered to the boilers through low and high heat-level condensers which raise its temperature to approximately 256 degrees. The admission of the feed water to the boilers is controlled by feed water regulators and the rate of admission as well as the temperature and pressure are metered by recording meters.

The generator house is divided into two floors as stated before, the upper floor containing the two 12,500 kw. turbo generator units, which at present comprise the main alternating current equipment. These operate at 1800 r. p. m. under 200 pounds steam pressure and generate current at a potential of 4600 volts. Exhaust from these turbines is condensed by two large surface condensers, one for each unit, each containing 22,000 square feet of condensing surface. The vacuum normally carried is 28½ inches.

Eight complete turbine driven alternator units are now being built by the Ford Motor Company in their River Rouge shops from their own designs. Each alternator is to have a capacity of 30,000 kw. at 2300 volts. The entire project when completed will come close to aggregating a quarter million of horsepower under one roof. The condensing equipment is also being built by the Ford Motor Company.

The electrical load is con-

Digitized by Google

trolled and distributed from the control room which is located in the "switch house," and which has a glass fronted bay overlooking the generator room. The operator by means of a push button equipped semi-circular control panel is able to literally "keep his fingers" upon the complete distribution of 4600 volt current generated at this plant. Like the modern central station installation there are no switches in the control room. These are located in the switch room below, inclosed in insulating cabinets, the switches being operated by motors whose operation is actuated by the push buttons on the control board. The air entering this room is refrigerated and dehumidified, thus reducing to a minimum the danger of arcing.

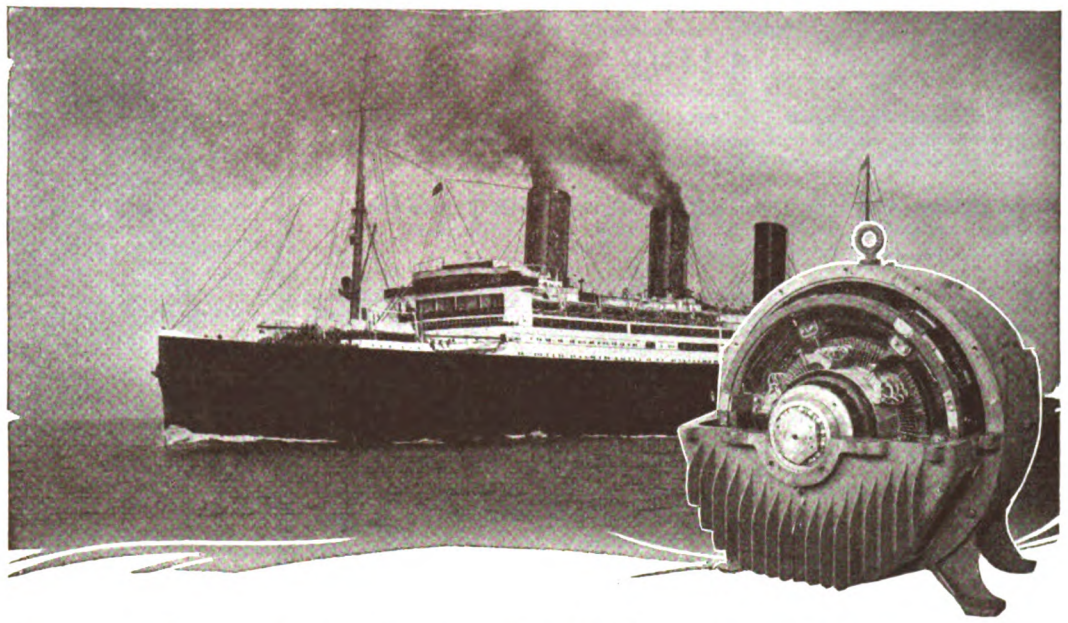
Taken altogether, the River Rouge power plant probably represents the ultimate in present-day development of power generating equipment. In it, waste utilization is carried to a high degree, heat losses are minimized, automatic control developed to a maximum and mechanical recording of all functions carried out. One seeing this plant might observe, "What is there left for the engineer to do?" There is a great deal left to do, in fact more to be done in the future than has already been done in the past. Lest one should get the idea that we are reaching anywhere near the ultimate in power production, we are quoting some extracts from an article by Mr. H. A. Spoehr, of the Carnegie Institution of Washington, which appeared in the January issue of the British publication, *Beama*.

"The fundamentally important point is in relation to the energy changes. The energy expended by the man has been permanently lost to a large extent; similarly, that obtained from fuel. The reconversion of the carbon dioxide into food or fuel material can be accomplished only by the use of a great deal of energy. The cycle is made possible only by the introduction of energy from without. This energy is derived from the sunlight, which the plant, unlike the animal, is able to utilize and convert the waste carbon dioxide again into food or fuel material.

"It thus becomes evident that all life on the planet depends upon the energy derived from the sun through the intermediary of the plant —*i.e.*, through the process of photosynthesis. Mankind lives entirely on the energy derived from the sun through the pursuits of agriculture.

"But in addition to this, we are squandering the principal of an enormous legacy of solar energy accumulated during the past ages. The fossil vegetation, preserved as coal and oil, represents a very small fraction of the energy which has been falling on the earth and which has been conserved for man. It is kindled, its energy liberated and used in a thousand ways, and the rays of sunlight stored beneath the earth for millions of years

SKF



Leviathan Relies on Ball-Bearing Motors for Continuous Forced Boiler Draft

THE giant ocean liner Leviathan, now being reconditioned, depends upon two 60,000 cu. ft. blowers to supply the forced boiler draft necessary to obtain its high speed of propulsion.

The direct-connected blower motors, therefore, must operate continuously for days in the hot hold of the ship and at times amidst the splashing of water.

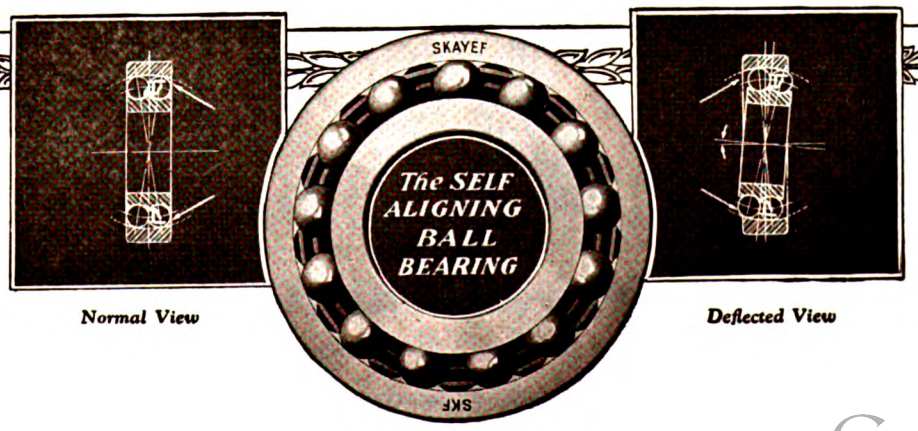
Two direct-current Diehl motors with special heat-radiating, water-tight enclosing covers are used for this purpose. The continuous duty rating of these enclosed motors is 50 H.P., 110 volts, 360 to 475 R.P.M.; the normal open rating being 150 H.P. Protection against motor failure due to dropped armatures and oil-soaked commutators and windings, is obtained by supporting the shafts on SKF marked self-aligning ball bearings mounted in sealed housings.

Their use for this exacting service and on the 29 Diehl motors used for general ventilation, is typical of the wide adaptability of ball bearings.

THE SKAYEF BALL BEARING COMPANY

Supervised by SKF INDUSTRIES, INC., 165 Broadway, New York City

875



Normal View *Deflected View*

BALL BEARINGS

The Highest Expression of the Bearing Principle

Digitized by Google

GOLDEN-ANDERSON

"Life and Property Insurance Valves"

Patent Automatic Double-Cushioned
Triple-Acting and Non-Return Valves

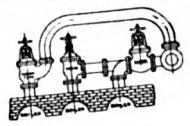
PROTECT YOUR PLANT AND GUARD YOUR MEN



DOUBLE EXTRA HEAVY VALVES

"Every Valve Sold with a Positive Guarantee."

"Hosts of References."



4100

Golden-Anderson Life and Property Insurance Valves are used in the iron and steel industry. Their repeat orders are the result of assured protection.

These Golden-Anderson Double Extra Heavy Patent Valves give absolute protection in case of back flow, pipe explosions, or admission of steam to cold boilers.

1—Instant isolation of a boiler in the event of a bursted tube or any other internal break causing a sudden drop of pressure.

2—All steam flow cut off the moment a steam line breaks at any point in your plant.

3—Boilers automatically cut in and out of service to equalize the pressure. This eliminates cutting in a fresh boiler by hand.

4—Cannot be opened by hand unless provided with patented safety latch attachment. It prevents the possibility of admitting live steam to a cold boiler.

5—No pounding, chattering or sticking. The perfectly cushioned double Corliss Dash Pot insures positively quiet seating.

6—The only valves that can be tested from the boiler room floor.

Golden - Anderson

Automatic Cushioned Water Pressure Regulating Valves



Will establish positively, steady reduced water pressure.

Easily adjusted from the outside. Fitted with patented safety piston to remove danger of high pressure from reaching low pressure side. Cushioned by water and air. No shock in seating.

Sizes to 30-inch.

Golden - Anderson

Cushioned Water Relief Valves Automatically Relieve Excess Pressure--Prevent Stress, Strain and Bursting Mains.



Essentials of a durable, economical and reliable relief valve are first class material and workmanship, correct mechanical construction and operation, with no metal-to-metal seats, and perfect air and water cushioning to avoid shock or hammer on the various pressures, all of Golden-Anderson Patent Automatic Cushioned Water Relief Valve.

Sizes to 30 in.

GOLDEN-ANDERSON PAT. CUSHIONED COMBINED THROTTLE AND AUTOMATIC ENGINE STOP VALVES

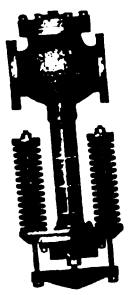


Gives perfect automatic control of steam or air flow in any pipe line from one or more distant points.

Can be opened or closed instantly in emergency by steam or electricity. May be tested while in service giving complete assurance of safety.

Sizes to 30"

GOLDEN-ANDERSON PAT. AUTOMATIC CUSHIONED STEAM PRESSURE REDUCING VALVES



Automatically holds the reduced steam pressure constant.

Fitted with patent safety piston that prevents high pressure escaping to low pressure side.

Sizes to 30"

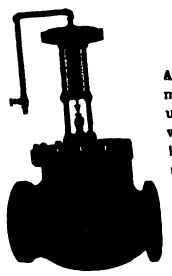
GOLDEN-ANDERSON PATENT AUTOMATIC DOUBLE CUSHION CHECK VALVE



Especially adapted for Hydraulic Elevator Service and on discharge side of pumps.

Sizes to 30"

GOLDEN-ANDERSON PATENT AUTOMATIC CONTROLLING ALTITUDE VALVES



Automatically maintains uniform water level in tank, standpipe or reservoir. No floats or fixtures.

No freezing.

Golden-Anderson Valve Specialty Co.

1306 Fulton Building — Pittsburgh, Pa.

give birth to a civilization such as the world has never known. It is this source of energy which has made possible the habitation of the temperat zones to the present extent, and on it depend our various modes of rapid transportation and our multifarious industrial activity. What may be called fossil solar energy, coal, made possible the reversal of the natural course by the smelting of ores for the production of metals. In fact, it is solar energy which counteracts the tendency of our earth to attain its maximum entropy.

"But this great civilization of coal and steel is at the same time a most squandrous and profligate one; it is using the principal of its legacy in numberless new ways. Modern man's greatness depends upon his being essentially a tool-using animal. To increase the efficiency of one-man power has been his object for centuries. It is the power-driven machine that has done most of his work. But the source of energy which drives these machines is not a steady stream, it is being drawn from the accumulation of centuries. A year's consumption of coal at the present rate represents the accumulation of hundreds of years. The power of man to do work, physical work, the unit one-man power, is now an almost insignificant factor. A return to such a physical standard would almost certainly follow the failure of such sources of energy as man now has at his disposal. The best of these sources of energy, coal and oil, is at present being pushed with a feverish intensity that has never been known before, and the competition for the possession of these stores recognizes no principle. The destiny of civilization is guided by and reflects the amount of available energy.

"And thus the scientific world is awakening to the necessity of taking stock of our available resources of energy. Repeatedly, attention has been called to the inexhaustible floods of solar energy. With cool theoretical nonchalance the untold possibilities of the use of the sun's energy are constantly called to our attention. Yet, the chlorophyllous

(*Continued on page 61*)

His Hand on his Machine's Pulse

The record of a Veeder Counter guides the machine operator much the same as a graphic chart guides the manager:

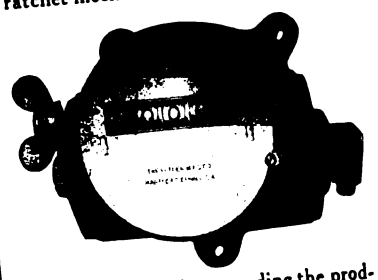
It tells how the work progresses; how production checks up with the standard rate; how fast the pieceworker is earning money.

It puts a man in position to intelligently *manage* his machine.

And with intelligent management goes a workmanlike interest that *scores high* on your

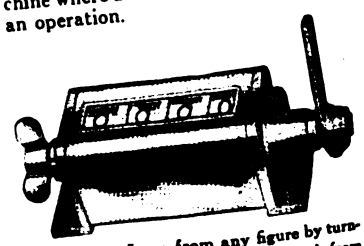
Veeder COUNTER

Here's a big new development in a Punch Press Counter; a heavy-cased ratchet mechanism, immensely durable:



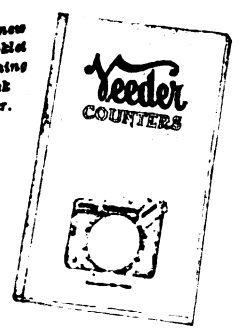
Built especially for recording the product of punch presses, metal stamping machines and other heavy-duty machinery. Strong stops limit the movement of the lever to 45 degrees or ⅛ turn, which registers one on the dial. The large, legible figures are easily read ten feet away. Counter is regularly furnished with five figure-wheels, and may be *set back to zero* by one turn of knob. Requires no special fixtures for attaching. Price, $18.00.

The Revolution Set-Back Counter below records the output of any machine where a shaft-revolution indicates an operation.



Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figure-wheels, as illustrated, $10.00—subject to discount. *Cut less than one-half size.* Set Back Rotary Ratchet Counter, to record reciprocating movements as on punch presses, $11.50 (list).

FREE—This new 80-page booklet shows everything you could ask in a counter. Ask for IT.



The Veeder Mfg. Co.

63 Sargeant St., Hartford, Conn.

Digitized by Google

The Story of Roofs that Endure



in the New
"Cementile" Catalogue

Write for a Copy
USE
the
COUPON

American Cement Tile Manufacturing Company
831 Oliver Building
Pittsburgh, Penna.
New York Philadelphia
Cleveland Birmingham

TEAR OFF THIS COUPON, FILL IN, AND MAIL IT—NOW

American Cement Tile Mfg. Co., 831 Oliver Bldg., Pittsburgh, Pa. Please send me a copy of the new "Cementile" Catalog

Name
Company
City
State
TITLE

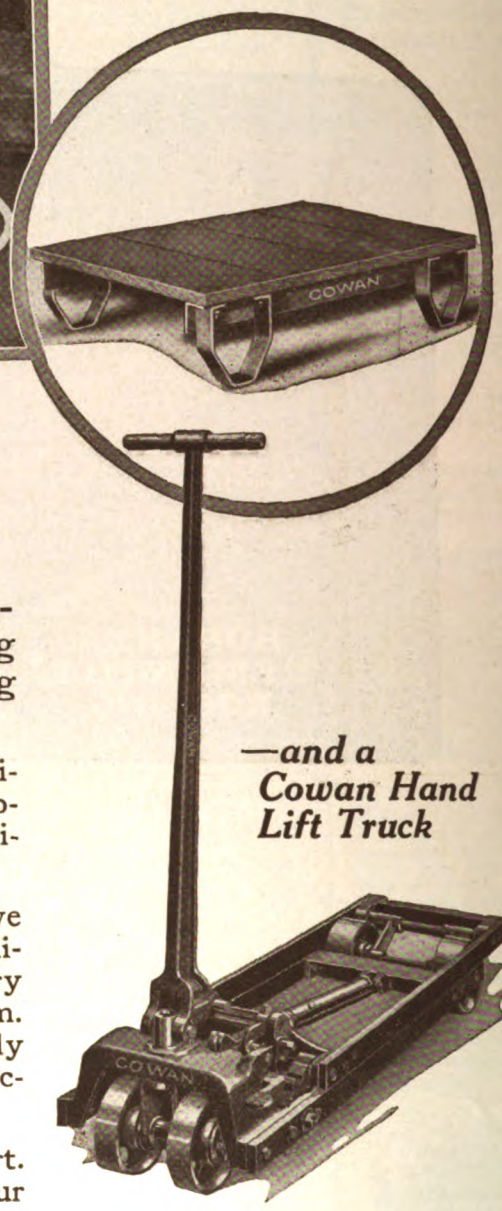
Digitized by Google

ELIMINATE REHANDLING



He runs the Cowan Hand Lift Truck under the loaded skid and with a single downward sweep of the handle elevates the truck platform, quickly and easily picking up the skid and its load. At destination, he steps on the foot pedal and skid and load are quickly and gently owered to the floor.
'No loading and unloading by hand—wasteful in time, labor and money. No truck delay. *One* man instead of a gang.

Cowan Skid Platforms for Your Loads



—and a Cowan Hand Lift Truck

HOW many times are your goods and materials loaded and unloaded by hand in moving them from point to point? Each rehandling wastes time, labor, and money.

The Cowan Hand Lift Truck and Skid System has eliminated costly rehandling and greatly reduced truck equipment investment and maintenance for thousands in practically every line of business.

One man and a *single* Cowan Hand Lift Truck often serve as many as fifty to one hundred skid platforms—duplicating the work of an extensive equipment of ordinary trucks and the force of men necessary to handle them. Cowan Long-Life Skid Platforms are strong, sturdy, simply constructed, and inexpensive. Their maintenance is practically negligible.

Eliminate rehandling. Send for a Cowan System expert. Without obligating you in any way he will analyze your material handling problem and fully explain how the Cowan System can reduce your material handling costs. Or write, briefly describing the materials you handle, and we will gladly mail information pertinent to your particular business.

The Cowan System includes Cowan Hand Lift Trucks, Long Life Skids, Electric Lift Trucks, Electric Load Carrying Trucks, and Electric Tractors—used individually or in combination.

COWAN TRUCK CO., 6 WATER ST., HOLYOKE, MASS.

New York Office: Grand Central Palace. Offices in Principal Cities

Largest manufacturers of complete Hand and Electric Industrial Truck Systems.

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "[illegible]ugh ticket" *system for* moving loads

Digitized by Google

(*Continued from page 58*)

plant still remains the only converter of solar energy!"

The day is surely coming when we shall obtain our fuels from the earth's agricultural annual increase, and no longer be dependent upon stored reserves. The same thing will doubtless be true with regard to a great many of our common metals and building materials. So the wonderful Ford power plant with its smokless, cinderless, automatically controlled combustion, is but one of the early steps toward the ultimate in energy transformation. Our future engineers have ahead of them virgin fields of effort so wonderful that as yet we are incapable of even imagining them in our dreams.

The Society of Automotive Engineeers has recently been the recipient of many highly complimentary letters from the U. S. Government officials and prominent men in the automotive industry with regard to its Employment Service work.

The appropriation for this work has been materially increased for the current year and, through a system of bulletins issued twice weekly, the Society keeps its members who are seeking employment, in constant touch with approximately one thousand of the leading manufacturers of passenger cars, cabs, trucks, trailers, tractors and farm machinery, isolated electric lighting plants, stationary engines, aircraft, motor boats, motorcycles, motor busses, motor railway equipment, production, machinery and tools, highway contractors and manufacturers of parts and accessories.

Since the establishment of the Bulletin service, the Society has placed an average of one man every other day in an engineering, sales or executive capacity, including general management.

The Service is free to any reputable company in the industry and may be used to a limited extent by applicants for positions who are not members of the Society, when the applicants have been endorsed by members.



No. 644 Gauntlet Glove, reinforced with flexible steel ribbons clinched over strips of tough leather. Extra leather patch on the thumb. $16.00 perdozen pairs.

To Keep Production at its Height

STEEL-GRIP GLOVES



No. 605 Short Glove steel ribbon einforcement and extra wearing patch in palm. $14.00 per dozen pairs.

No wonder your men can produce more when equipped with Steel-Gripe,—they go at their work without any fear of torn or bruised hands, confident in the protection these tough gloves give them.

Just see how they're made—three thicknesses of wearing surfaces and a comfortable felt lining—flexible steel ribbon re-inforcement clinched over tough strips of leather. They can't come loose nor hurt the hand. All gloves are stitched with strong steel thread—no danger of seams ripping, burning nor tearing out.

Steel-Gripe are built for long wear in rough service. They save the time the men ordinarily take up in frequent trips to the store room to get "another pair of gloves."

Different working conditions require different styles of gloves—we make gloves to fill all industrial requirements.

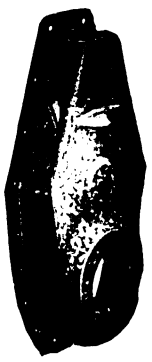
Send for catalogue.
Try a dozen pairs.

INDUSTRIAL GLOVES CORP.

2647 Maplewood Ave., Chicago.

STEEL GRIP

Reduce Your Manufacturing Costs With Stampings And Pressed Metal Parts





IF you are now a user of pressed metal, it will pay you to get the benefit of our competition for your requirements. If you are using castings, forgings or wooden parts in large numbers, the chances are that our engineers can design pressed steel to take their place. Pressed steel is always lighter, universally stronger and generally cheaper.

And there's a reason.

We have a 15 acre plant which every day turns out 100,000 parts of every description—in steel, brass, aluminum, copper, monel and zinc—delivered to your plant all ready for assembly.

Presses of every size and description are available for the most intricate jobs irrespective of size or other dimensions.

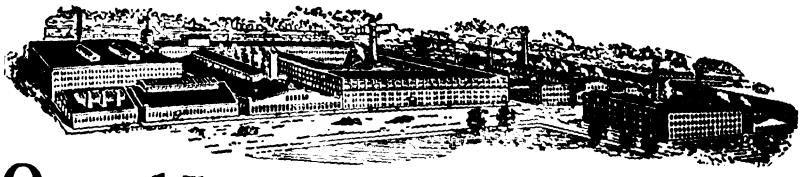
We are able to make and deliver metal parts to you at much lower cost than can be made in your own plant or in a small organization, because of our facilities, large scale output and careful attention to every detail of economical production.

Over 41 years experience in this work.

Let us show you what G. P. & F. Service can do in reducing your production costs. Send blueprints or samples for estimates. No obligation on your part, if you write

GEUDER PAESCHKE & FREY CO.
1457-1750 CANAL ST., MILWAUKEE, WIS.
CHICAGO: 352-358 WEST OHIO STREET

G.P.&F. Service

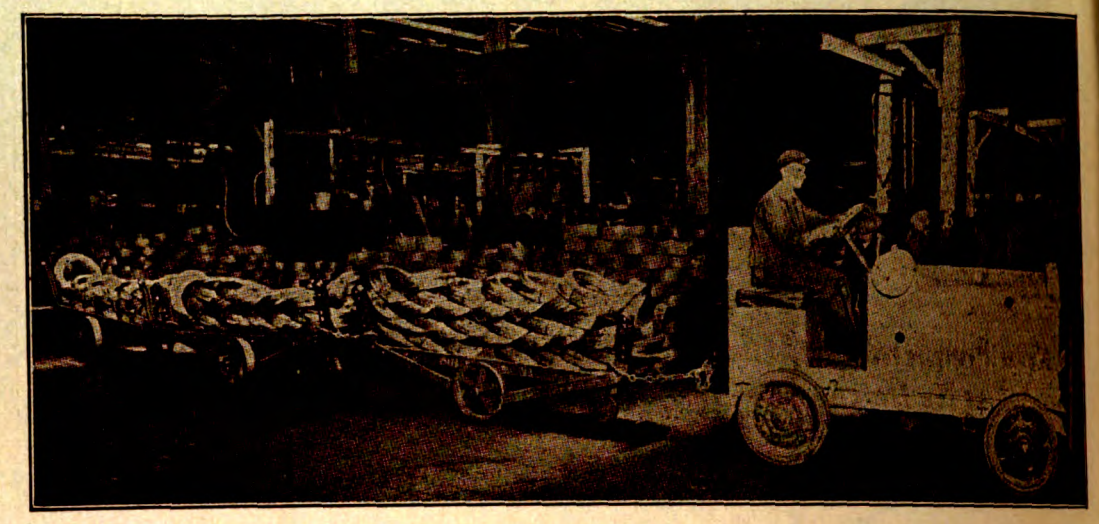


Over 15 Acres of Floor Space

Digitized by Google

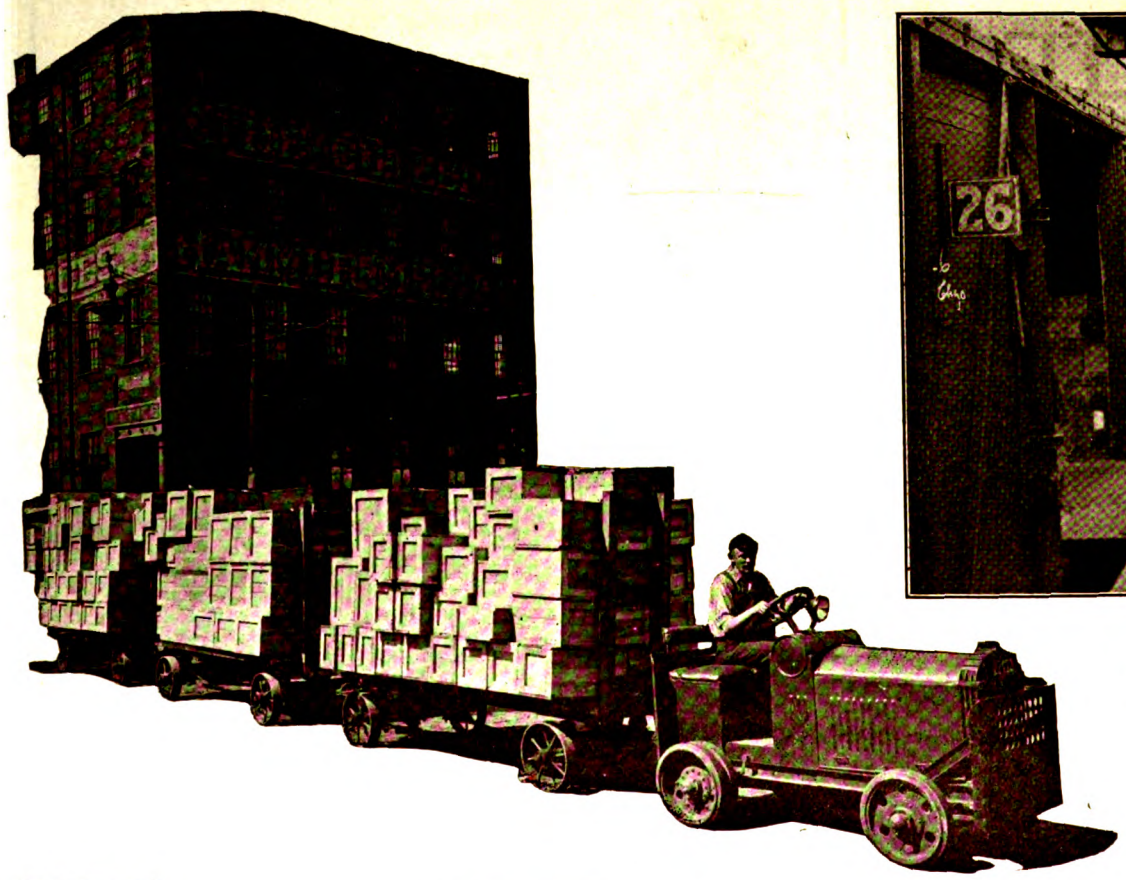
THE TOWMOTOR

"Every Day
In Every Way"
Increasing Orders
Show that



TOWMOTORS

Are Justifying Their High Reputation for Quality, Economy and Service





THE TOWMOTOR COMPANY
1226 East 152d St.
Cleveland, Ohio

THE TOWMOTOR

Digitized by Google

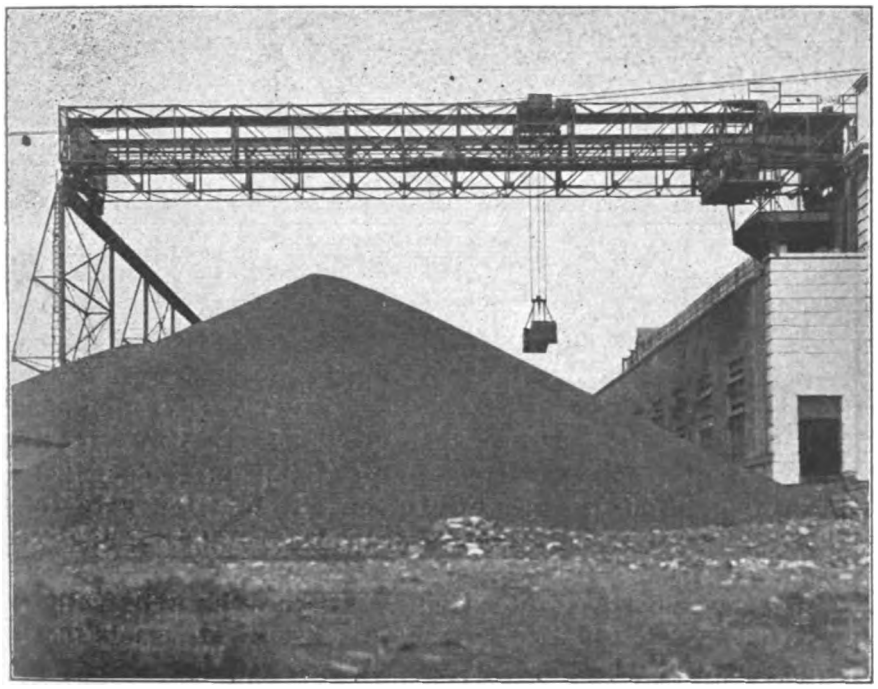
Storing and Handling Materials in the Plant Yard

(*Continued from page 17*)

tion from rain or moisture; third, the activities requiring no protection.

If you will make an analysis of this sort you may be surprised at the result, particularly if you will make the analysis on a "square foot" basis.

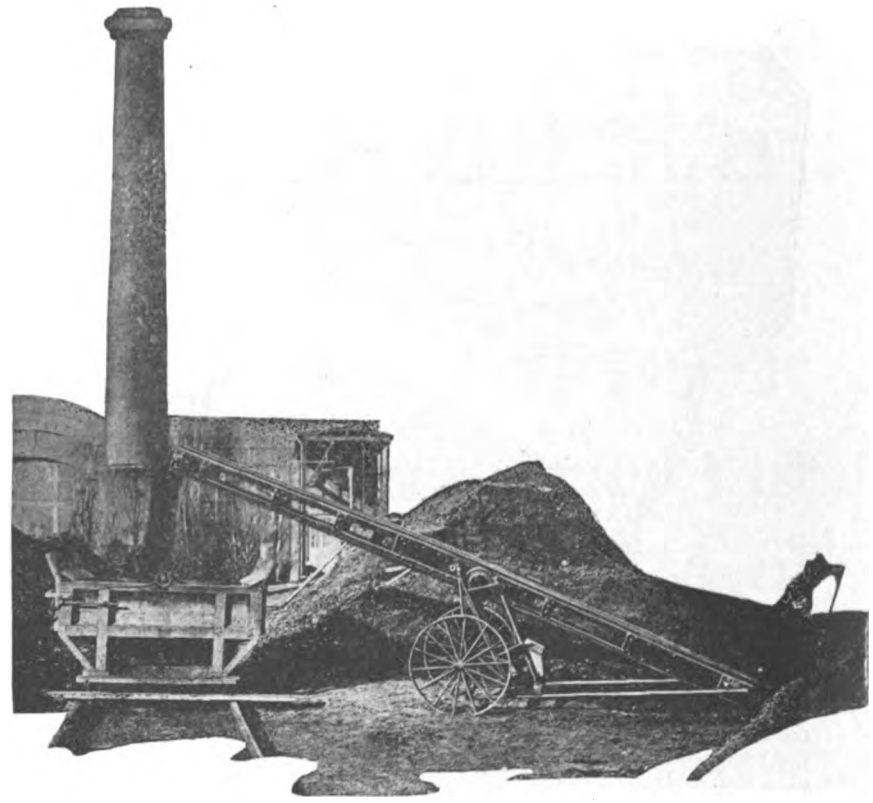
The recollection is very distinct of the first analysis of this sort which came under my own observation. The product involved was an assembled apparatus composed largely of iron castings which required very little machining other than milling and drilling. The production volume was large and the variety large also. shed and racks for semi-finished product and with a complete rearrangement of machines and assembling, this building would serve its purpose for many years to come, in spite of an expected, constant growth in business. And not only did this alteration do away with the necessity of an expensive addition; it also cheapened the cost of the product. It did this in two ways; first, because the improved handling machinery which was installed between the yard and the department was found to operate at less cost in labor and time than the old scheme of lifting and hauling by hand within the department, and



This four-motor electric crane handles 100 tons of coal per hour and is fitted with hopper, crusher and weighing scale.

When this department began to be "pushed for space" the question arose as to what could be done and the suggestion was made of an additional building. First, however, the floor space was gone over and checked up in ten-foot squares to see how it was actually being used. Less than twenty per cent of it was being used for actual production as represented by machining and assembling operations. The remainder was occupied by accumulations of stock in a rough, a semi-finished and finished state, and by "waste space." It was found that with the proper utilization of the adjoining yard with open storage of rough stock and with a second, that in removing the excuse for the huge piles of miscellaneous stock it became necessary to plan requirements more closely, thus reducing materially the investment in work-in-process. Even a third improvement might be cited in that by concentrating the real production activities it was possible to supervise them much more closely.

Especially in machining departments, it will often seem as though every square foot of floor space is being properly utilized. There was a case of this kind not long ago which came to the attention of the writer. In this case there was no accumulation of rough or semi-finished stock paying rent



Cuts Handling Costs 75%

THE Atlantic Coast Electric Railway Co., Asbury Park, N. J., Say—"Four men and your conveyors are now storing aud reclaiming the coal that formerly required 30 men. You can figure our savings by the difference in number of men employed who receive $4 a day for this work."

The Union Seed & Fertilizer Company, Macon, Ga., Say—"It is necessary to load all of our clinkers in cars which can now be done at an expense of about $6 against $25 to $30 without the machine."

The Pendleton Manufacturing Co., Autun, S. C., Say—"We use the Scoop Conveyor for unloading coal, crushed stone and loading cotton seed. Its principal use is in unloading coal from car to truck and it saves us the cost of hand shovelling."

The Imperial Porcelain Works, Trenton, N. J., Say—"We have had two of your Portable Scoop Conveyors at work in our plants for the past year. We desire to express to you our entire satisfaction with this investment."

Write for Catalog No. 158

Portable Machinery Co.,
PASSAIC, N. J.

ask any user

THE SCOOP CONVEYOR

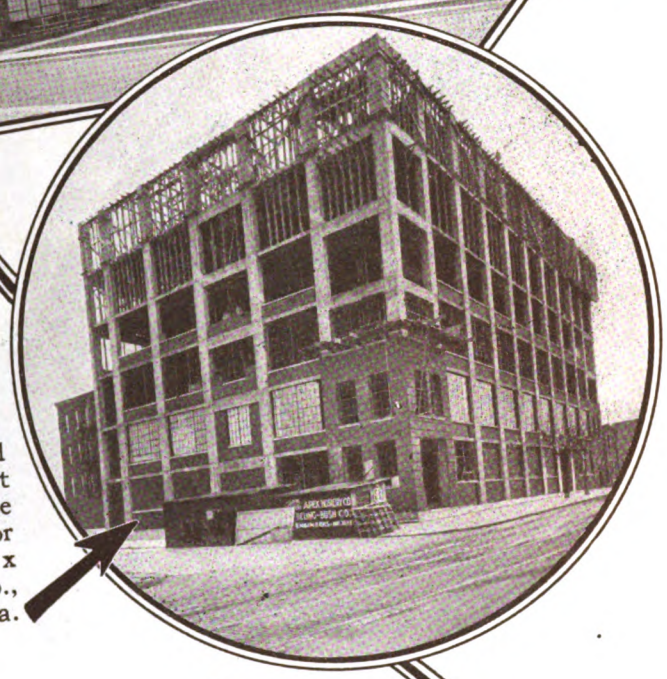
Digitized by Google

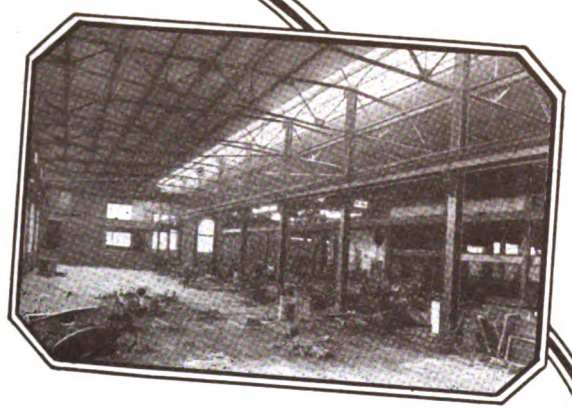


The Royersford Needle Works. Finished in 47 days. Our clients were so satisfied they recommendedus to others, which explains

WHY

we secured the contract to erect the building for the Apex Hosiery Co., Philadelphia.





Foundry Building, Hills - Jones Plant of the Consolidated Machine Tool Co., Wilmington, Del.

Save Time and Money through the Beling-Bush System of Standardized Building.

YOU owe it to yourself and your company to investigate the Beling-Bush Method of Standardized Factory Construction. We can build your new plant or that addition in 30, 60 or 90 days. You'll find our work so high-class and thorough that you too will go out of your way to recommend us to your friends when they want to build. With us you save because of centralized responsibility on plans and construction and in the elimination of a vast amount of time and effort.

If you are considering a new building, write us for our catalog and information. Such an inquiry involves you in no way, yet it may result to our mutual satisfaction.

THE BELING-BUSH CO., INC.

Factory Engineers and Builders

THE SERVICE

Drexel Building **Philadelphia, Pa.**

for the high class accommodations accompanied by light, heat and power. The machines were arranged in orderly rows with definite aisles for shop truck transportation. One would say at first glance that all of the floor space available was being used. Yet as a matter of fact there was fully a twenty per cent wastage.

your buildings getting crowded you can generally make plenty of room for additional production under the roof of existing buildings, providing that you put your machines as closely together as possible, and make provision for storing in the yard such parts and materials as do not require to be actually in a closed building.



Yard cranes such as the above are indispensable for handling flasks in and out of steel and iron foundries. This ten-ton crane is installed at the Riverside Steel Casting Company, Newark, N. J.

It was impossible to convince the plant superintendent of this fact until he was taken to Detroit and shown the methods of machine arrangement employed in the Ford plants. Ford gets three machines in the floor space ordinarily occupied by two. One who is accustomed to the arrangement of machines in the average department at other plants would say that the Ford plant leaves scarcely enough room between the machines for the workers to move about comfortably. This, however, is largely a matter of becoming accustomed to conditions. One of the Ford principles is that a machine operator is employed to operate a machine, not to take unnecessary steps. The work moves and the men stand still. Putting these machines so close together not only eliminates shop pedestrianism, but also shortens the total length of path over which the product must pass in its journey from its initial to its completed state.

"But," you will ask, "what has all this to do with the plant yard?" It has a whole lot to do with it. When you find

A course of this kind would not be practical were it not for the great variety of handling machinery that we have available today, machinery that will run out into the yard for us and fetch and carry that which we require.

There is an apparently endless list of materials that are at home in the modern plant yard. Coal, coke, sand, pig iron, scrap iron, limestone, pipe, bar steel, structural shapes, brick, sheet iron, lumber, ingots, steel and iron castings, foundry flasks, and dozens of other materials claim the plant yard as their habitat. As many varieties and types of mechanical handling appliances are available for giving these things motility. Every engineer and executive who has anything to do with production or with planning the arrangement of factories or with arriving at decisions regarding plant extensions should be familiar with these various types of handling equipment which make open air floor space a close-knit adjunct of the enclosed production department.

(Continued on page 66)

Digitized by Google

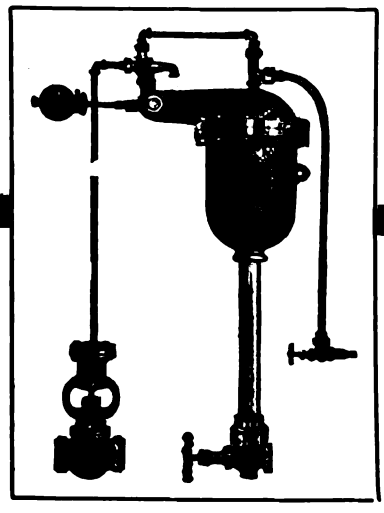
DIAGRAPH
YOUR SHIPMENTS

The Diagraph cuts legible address stencils for marking all packages, boxes, bags, cans, crates, castings and similar material. Addresses do not blur, wash or rub off. Safer than tags. A practical insurance against lost and delayed shipments.

Try one free in your own shipping room—price complete with all supplies, only $110.00 delivered, in either housed or open models. Order one on trial—no obligation to buy—we pay all charges.

DIAGRAPH STENCIL MACHINE CORPORATION
1625 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities. See phone books.





VIGILANT
Feed Water Regulator

—what power man would fail to insulate

HIS STEAM LINES

certainly none—then why gamble with anything as unsafe and uncertain as hand regulation of feed water which may waste as much fuel as the unprotected steam line.

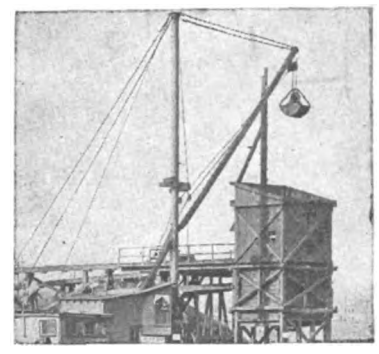
Play safe. Put your water level on an automatic basis by installing Vigilant feed water regulators. Correct boiler feeding will save you fuel expense sufficient to pay for the regulator in a short time.

Vigilant Feed Water Regulators hold the water level at a fixed point, under all operating conditions and at all boiler loads. Their operation depends upon gravity and not upon expansion tubes, floats or diaphragms. That is why they stand in the foremost rank for reliability. Write for 52 page catalog.

The Chaplin Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh, Pa.

MECHANIZE
MATERIALS HANDLING

Efficient Equipment Saves More Than Its Cost!



A Permanent Installation Requires Not Only Good Equipment But "Know How" As Well

Haiss is a specialist in ways, means and equipment for handling *loose materials*, (coal, coke, sand, building materials, etc.)—and has been just that for 30 years. Haiss Engineers have the "know how" that enables them to recommend handling equipment that cuts cost to the bone. You can profitably apply this engineering skill to your own need—there's no obligation.

Haiss Builds

Mechanical Equipment Complete for Unloading and Storage Plants

Bucket and Flight Elevators

Mast and Boom Hoisting Plants

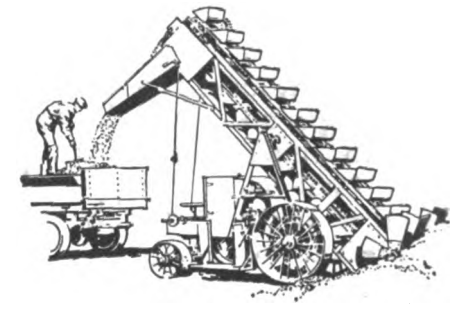
Clam Shell Buckets

Cable and Automatic Cars

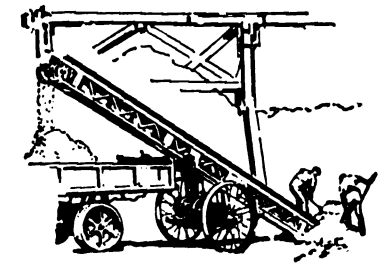
Screens, Chutes, Hopper Gates, etc.

Haiss Equipment, too, has something to it. Designs have been worked out which make the various units long-lived and trouble-free. Even in simple things the "know how" adds a measure of efficiency.

Portable Loaders and Belt Conveyors Have Great Flexibility of Application



Rehandling from storage piles is often a more practical job for a simple portable loading machine than for more elaborate equipment. The Haiss Machines have ample capacity for almost any requirement and the added virtue of lower investment cost and economical operation. You can have anything up to a full-automatic loader, where the operator merely pulls control levers.



Let Us Show You How to Save Money

The Geo. Haiss Manufacturing Co., Inc.
146th St. & Canal Place, New York
Established 1892
Representatives throughout the world

The Geo. Haiss Mfg. Co.
New York, N. Y.
Please send me your catalogs on Equipment for handling .....
.....
Name .....
Address .....

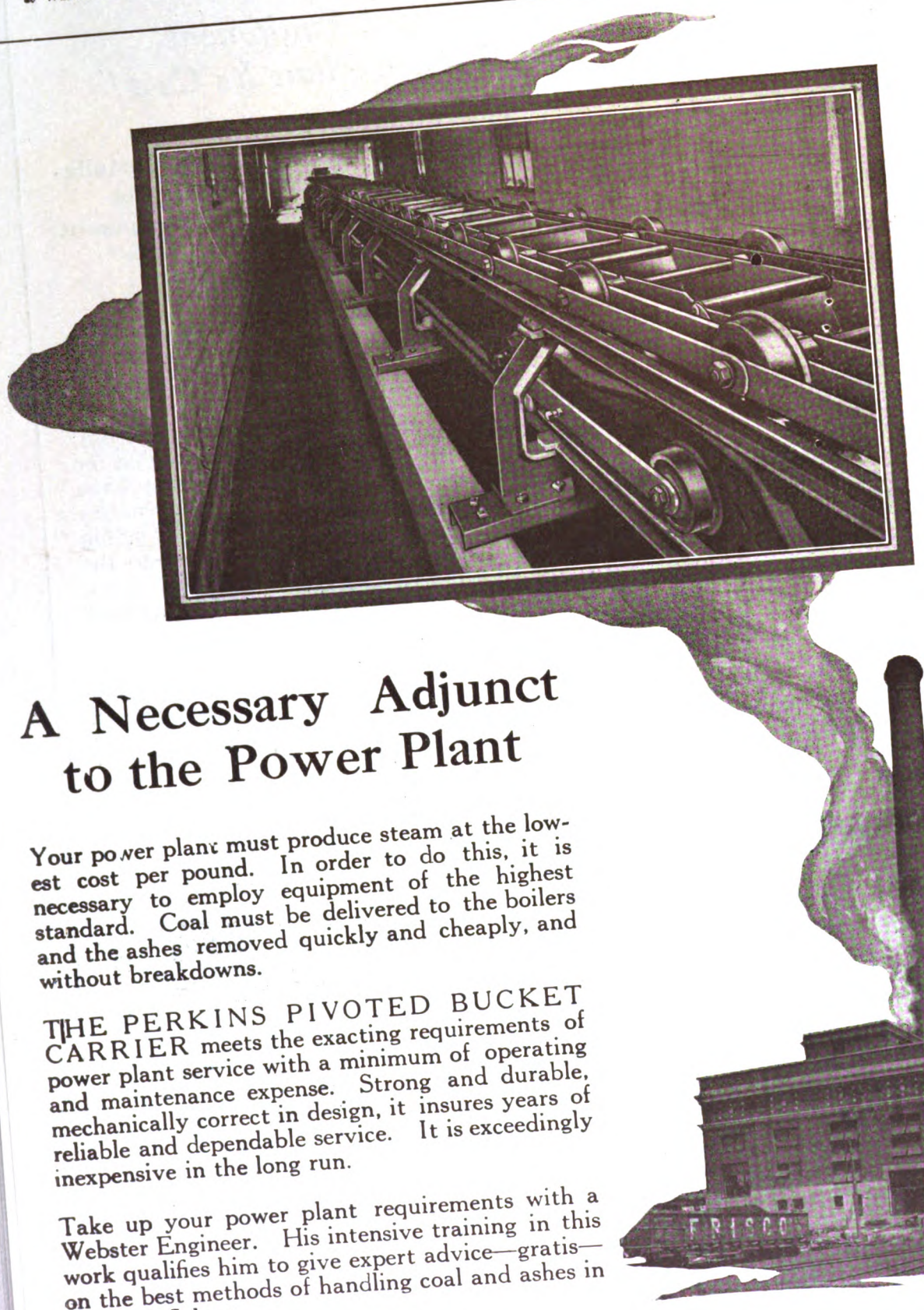
Digitized by Google

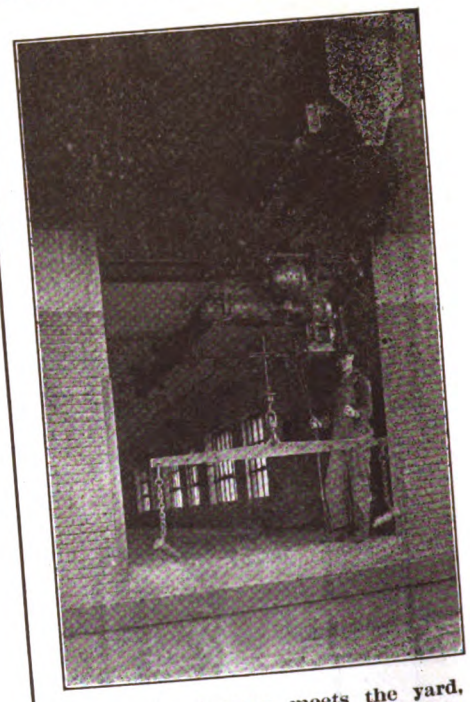
(Continued from page 64)

But in addition to this the engineer and executive must go further in his study and be familiar with the modern trend or tendency in the layout of plant operations. If the yard is to be knit into the plant as a whole it must be done under the principles governing the flow of product in the process as a whole. And so just a word about this trend.

There was a time not long ago when the ingenuity of the designer, inventor, superintendent and plant manager was centered in the increase of productivity of individual machines. A great deal of machine, these machines have time and thought was given to reached a high state of perfec- cutting speeds and feeds, to tion. It is no longer possible the perfection of automatic to improve them very greatly, and semi-automatic produc- even with the expenditure of tion tools, to multiple tooling much time and thought. So and the like. As a result of we must look elsewhere for this intensive centering of our economies. Up to date plant managers are finding these possibilities for further economy to lie in the knitting up of the process as a whole through mechanical transportation. They have found that there have been far greater losses which have occurred between the machines than at the machines themselves. They have found that there is a fruitful field for cost reduction in eliminating these losses, a field so big and rich with possibilities that it will keep them busy cultivating and harvesting it for the next decade or two. And so the modern plant manager spends most of his time today thinking about the process as a whole instead of the individual machine. In so thinking, his criterion must be overall efficiency as distinguished from individual efficiency. Oftentimes it will pay him to sacrifice perhaps ten or fifteen per cent on an individual machine or operation in order to make this machine or operation better fit into the process as a whole and thus increase overall efficiency. It is this new system of thinking that promises so much for the development of future American industry, and which enables

(Continued on page 68)





Where the factory meets the yard, transportation is assured by this electric hoist equipped monorail which lifts huge bales of paper into a printing plant.

A Necessary Adjunct to the Power Plant

Your power plant must produce steam at the lowest cost per pound. In order to do this, it is necessary to employ equipment of the highest standard. Coal must be delivered to the boilers and the ashes removed quickly and cheaply, and without breakdowns.

THE PERKINS PIVOTED BUCKET CARRIER meets the exacting requirements of power plant service with a minimum of operating and maintenance expense. Strong and durable, mechanically correct in design, it insures years of reliable and dependable service. It is exceedingly inexpensive in the long run.

Take up your power plant requirements with a Webster Engineer. His intensive training in this work qualifies him to give expert advice—gratis—on the best methods of handling coal and ashes in the power plant.

THE WEBSTER MFG. COMPANY

4500-4560 CORTLAND ST., CHICAGO

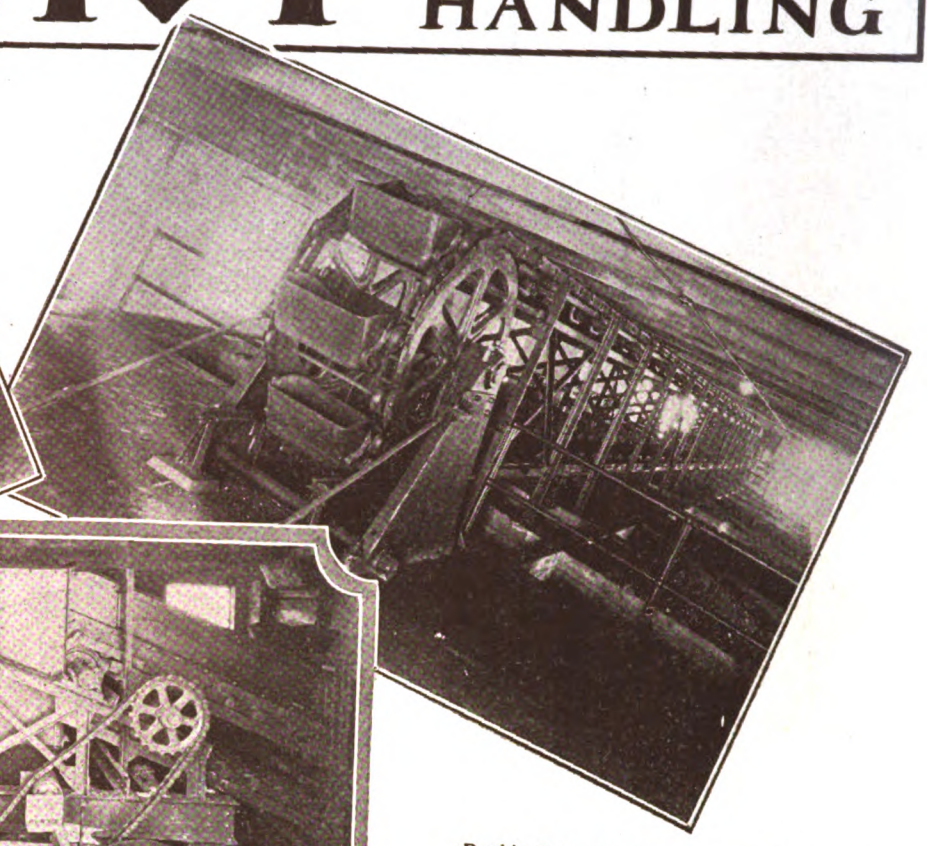
Factories Tiffin, O. *and* Chicago-Sales Offices *in* Principal Cities

Digitized by Google

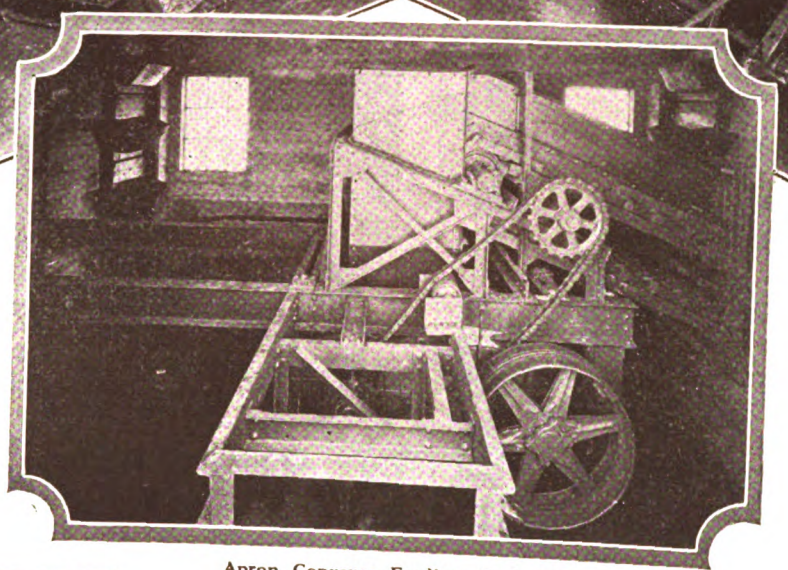
COAL & ASH HUNT HANDLING



Control Panel and Hoisting Machinery for Skip Hoist Operated by push button switch located at most convenient point.



Double Run of Conveyor over Coal Bunker. Coal is discharged directly into bunkers from lower run of conveyor.



Apron Conveyor Feeding Coal into Coal Cracker. The apron type insures a more even flow to the cracker.



Electrically Operated Traveling Weigh Larry. Everything controlled from operator's platform. Valves opened and closed; coal weighed and registered by type register beam.

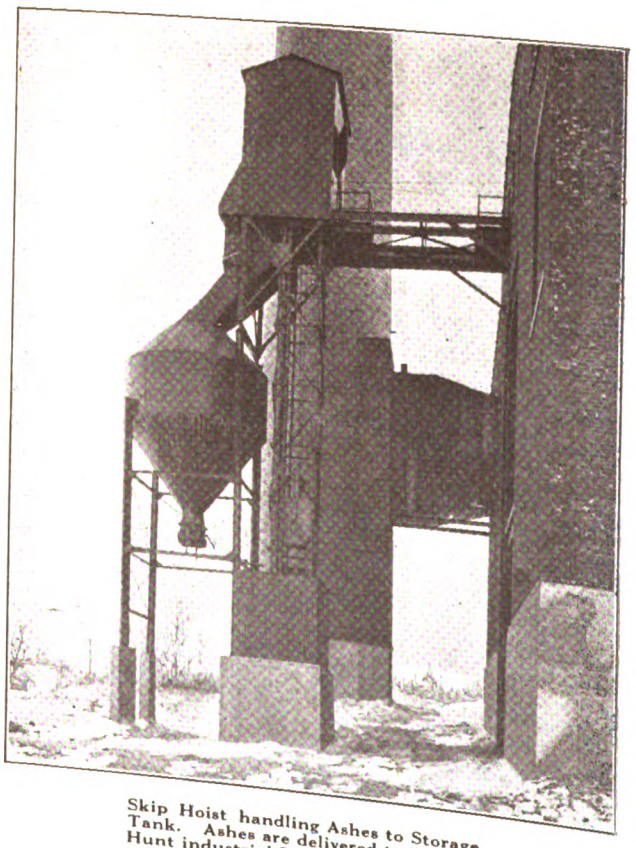
Power Costs Are Cut Here

THE evident advantages to the Utica State Hospital power plant upon operating economy and efficiency through Hunt Cost cutting equipment, shown here, cannot be overestimated.

From the time coal is received, its energy utilized and until it is carted away as ashes, every operation in its conveyance to the stokers and ash bin represents the strictest economy, combined with the utmost dispatch and the minimum of labor.

The same efficiency and economy can be effected in **your** power plant. Let Hunt Engineers prepare a layout.

C. W. Hunt Co., Inc.
West New Brighton New York
New York office, 143 Liberty St
Phillips, Lang & Co., Inc.
538 South Dearborn Street
Chicago, Ill.
Ernest F. Learned
141 Milk Street
Boston, Mass.



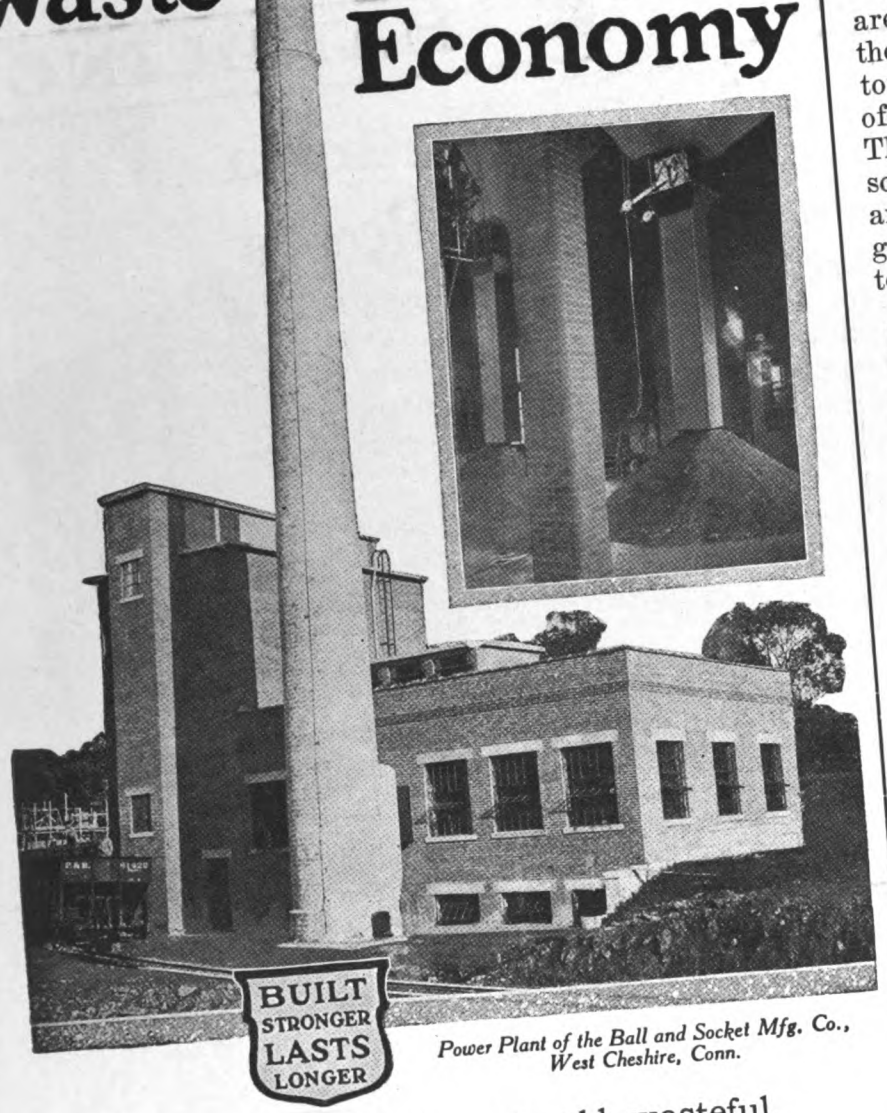
Skip Hoist handling Ashes to Storage Tank. Ashes are delivered to Skip by Hunt industrial Railway cars.



General View of Utica State Hospital Power Plant

Digitized by Google

Waste Turned to Economy



Power Plant of the Ball and Socket Mfg. Co., West Cheshire, Conn.

BUILT STRONGER LASTS LONGER

Imagine the saving over old, wasteful, manual methods by efficient G-W coal handling machinery in this plant! Coal cars dump directly into truck hopper, from which a reciprocating feeder loads an elevator conveyor having a capacity of 50 tons per hour. The coal is elevated vertically 50 feet, then carried 30 feet horizontally over the 200 ton concrete bunker. It is distributed to the proper bin by a rack and pinion gate, and fed directly to the boiler room floor by two down spouts with regulating valves.

G-W Power Plant Engineers will be glad to study your coal handling requirements with you and help effect economies that reflect in profits.

The Gifford-Wood Company specializes in elevating and conveying machinery for all lines of industry, including coal pockets (wood, steel, concrete; rectangular, silo), screens, hoppers, locomotive coaling stations, elevating and conveying equipment for ashes, stone, sand, gravel; pivoted bucket carriers, warehouse conveyors, portable conveyors, wagon loaders, car unloaders, friction clutches, hoists.

MAIN OFFICE AND WORKS: HUDSON, N. Y.

New York: 50 Church St. Boston: 24 Milk St.
Chicago: 565 W. Washington St. Buffalo: Electric Bldg.

Gifford-Wood Co.

MATERIAL HANDLING EQUIPMENT

(Continued from page 66)

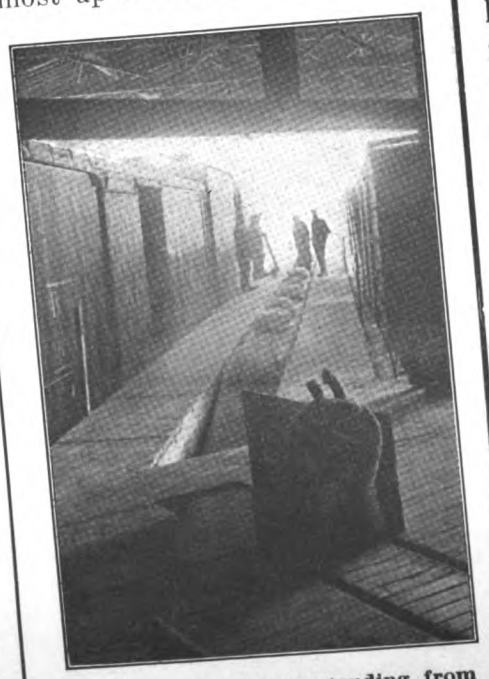
the plant yard to be such a valuable adjunct to the manufacturing departments.

It is for this reason that we are publishing in this article, the first of a series dealing pictorially with the possibilities of plant yard transportation. The subjects to be covered are so numerous, so interesting and so full of profitable suggestions that it is impossible to cover them fully in a single



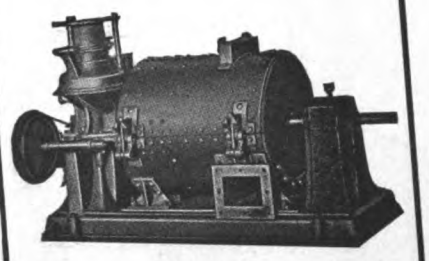
Electric storage battery locomotives push and pull loaded cars through the yards of this large foundry.

issue. Millions of tons of materials are moved and handled about the yards of the plants of our country in the course of a year. On the average, it is perfectly safe to say that there is still room for a fifty per cent improvement with a total resultant saving to the industries of many millions of dollars annually. It is with the hope of suggesting means of reclaiming some of these lost millions that we are presenting the practice of the most up-to-date plants.



Wood slat conveyors extending from the plant into loading sheds enable cars to be loaded with the least expenditure of time and money.

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

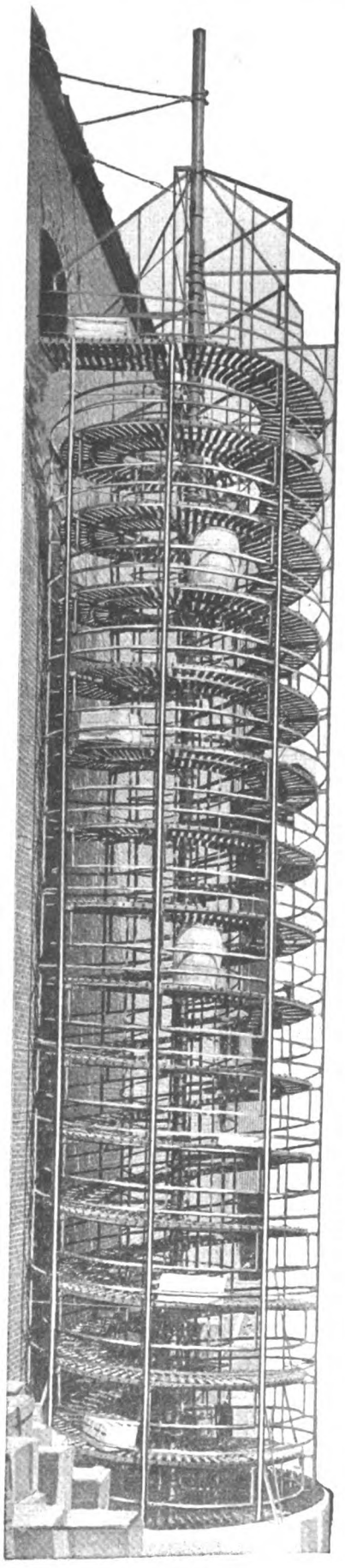
Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway
New York

Digitized by Google

From Top Floor to Shipping Platform with no Expense for Power



TOWERING alongside the warehouse it stands, a vast coil of steel and iron. Day in and day out, hour after hour, boxes and barrels and crates glide down its length from packing room to shipping yard. No hand touches or guides them in transit. One man loads at the top, another unloads at the bottom: natural gravity does the rest.

It's a Mathews Gravity Spiral Conveyer, operating at no expense for power. Gravity—the Earth's attraction—supplies power free. Goods placed on its steel, ball-bearing rollers are carried downwards quickly, surely and economically.

Mathews Gravity Conveyers fill the conveying needs of almost every industry. There are many types, including chutes, automatic elevators, spiral and straight carriers adapted to practically any product. They move dairy products or glassware, boxes, trays of all sorts—from floor to floor, from machine to machine, around corners, over obstacles, across courts, from factory right into freight car. They are portable or permanent, serving for light or heavy work indoors and out.

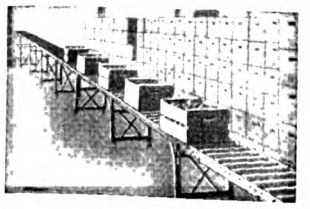
Compare the Mathews Gravity Roller Conveyer with other methods of conveying and you will realize its economy. It saves miles of walking and hours of time spent in trucking or running elevators. It economizes floor-space, avoids wear and tear on flooring. Delays, breakages, mistakes are eliminated. It conserves labor, speeds up production and cuts overhead.

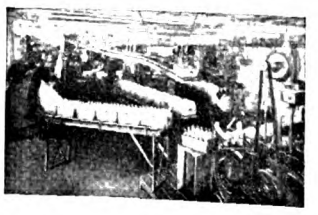
The Mathews Gravity Carrier Company are pioneers of gravity conveying. Fifteen years, devoted exclusively to the manufacture of gravity conveyers, have enabled this company to develop many special features that make for greater durability and efficiency of service. Our engineers are at the disposal of all who have conveying problems to solve. Write for particulars, or have a trained man call.

THE MATHEWS GRAVITY CARRIER COMPANY
103 Tenth Street, Ellwood City, Pa.

Branch Factories: PORT HOPE, ONTARIO—LONDON, ENGLAND

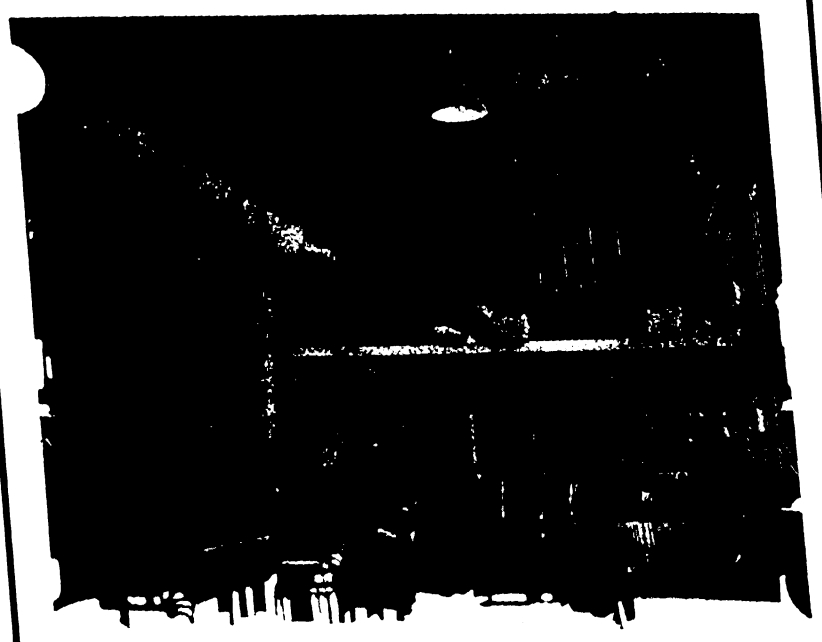








Digitized by Google



Eight profitable uses of moving air—

How many of them will prove valuable in your plant?

MANY a product would be better—many a handling operation would be carried out at reduced cost—if executives and managers would give more attention to the use of moving air supplied and controlled by Clarage-Kalamazoo Fans and Blowers.

Here are a number of typical uses:

Paper, cotton, wool, hemp, rags—all sorts of light loose materials—are conveyed when and where wanted, at a fraction of the cost of trucking, by pneumatic conveyors which blow the material through pipes.

Dust and dirt is collected at its source, improving air; reclaiming material; minimizing fire hazard.

Warm air is blown to roofs, stopping the dropping of condensation in paper mills and similar plants.

Gas production is being increased, blowing periods reduced.

Waste heat is being drawn from ovens, kilns, or any pure air source, and is used to heat factories. Where feasible, this entirely eliminates the cost of factory heating.

The cost of drying is greatly cut in many varied industries.

Used for mechanical draft, Clarage-Kalamazoo Fans are boosting boiler capacity and efficiency.

Pure air from out-doors properly washed, heated, and humidified is improving workers' efficiency and increasing production.

Actual dollar-saving examples of these and other uses are given in detail in the Clarage book on moving air. Surely one or more of the varied applications will coincide with your needs.

Clarage Fan Co., Kalamazoo, Michigan

New York City, Minneapolis, Cleveland, Pittsburgh, Detroit, New England Elec. Equip. Co., Boston, Los Angeles, Philadelphia, Chicago, Indianapolis, Rochester, N. Y.

CLARAGE KALAMAZOO Multiblade Fans

This book—

tells how to put air to work

—ask for it



Roofing the Old and the New Buildings

(*Continued from page 14*)

iron" of early days gave way to the cheap quickly-made Bessemer steel which proved to be extremely short lived for exposed sheet metal work.

Extensive, careful experiment discovered why some irons or steels rust so quickly while others last for many, many years. The reason is electrolysis, due to variation in the composition of the metal. Some parts of the sheet may be almost pure iron, while impurities seem to gather in patches or in tiny points where rust begins at once and quickly eats tiny holes in the metal, through a process of electrolysis which causes corrosion or extremely rapid rusting of the impure spots. Today, iron or steel made by the open hearth process is the only kind used to any extent for exterior work, and this usually gives excellent service; the character of the metal being different—much more even in composition.

Given a well-laid sheet iron or sheet steel roof, in which the metal itself is of the best, and in which the under side has been properly protected, there is just one word which sums up the whole question of service and long life—Paint. On this all-important subject, the following extract from the instructions of a large manufacturer of roofing and siding sheet metal is well worth quoting:—

"Many different types of paint have been offered for the protection of metal buildings. Some of these are almost worthless, while others have, in most cases, given satisfactory results. Among the latter may be mentioned natural oxide of iron ground in pure linseed oil. Recent careful investigations, however, have demonstrated conclusively that the very best results in painting unprotected sheets are obtained by using as the first coat, red lead (containing not less than 85 per cent. $Pb_4\ O_3$) ground in pure linseed oil. For the second coat part of the red lead may be replaced by carbon black or some other inert pigment, and the third or top coat may be any good moisture excluder, such as graphite. It is important that the first coat, or the coat next to the bare metal, be of a basic nature, and red lead has been found to be one of the best basic pigments.

"In painting galvanized sheets, inasmuch as the zinc coating is electro-positive to the base material, which is in itself an additional protection, it is perhaps not so important that red lead be used, and first quality iron oxide ground in linseed oil is, therefore, recommended for painting galvanized sheets. It is a well known fact that if paint is applied to new galvanized sheets, it is almost certain to peel off. It is, therefore, important that the surface be slightly roughened before applying the first coat of paint. This is best accomplished by exposing the sheets to natural weather conditions for a period of from six to twelve months, before painting.

"It is economy to use only good grades of paint. Always use good brushes, rub the paint well on, and do not spread it out too thin. Roofs and sheet metal work should be kept well painted—the intervals depending largely upon climatic conditions. After the initial coats, as above described, paints may harmonize with any desired color scheme."

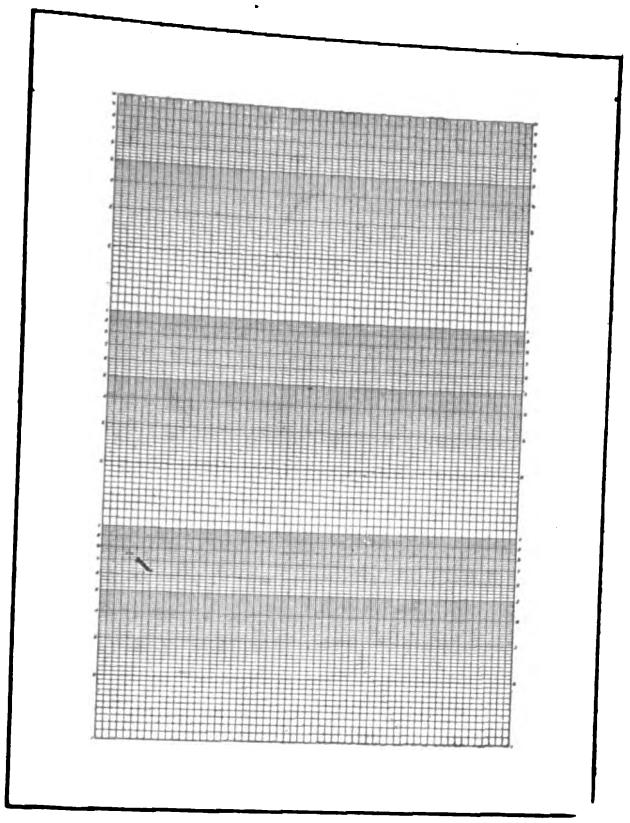
A roofing material which is finding increasing favor of later years is the cement tile. Being a manufactured product, it is easier to handle and to apply than the old time slate roof (though the latter is by no means in the discard, as yet). Furthermore, the several makes of cement tile now available were conceived with a definite purpose: to supply the well-known permanency of a tile roof, without the excessive cost hitherto associated with that type of roof.

All of the different roofing materials so far considered, are applicable to surfaces

(*Continued on page 72*)

Digitized by Google

EDEXCO CHARTING PAPERS
for putting BUSINESS RECORDS in GRAPHIC FORM



No. 181 Arithilog ratio paper.

1. They are printed on letter size paper, so that they are easy to file in letter files or bind up with typewritten reports.

2. Wide margins are left around engravings for insertion of scales, headings and notes. They are printed on white (on one side only) in a color of ink which reproduces readily.

3. They are printed on a paper which is strong enough to stand hard usage but which is unwatermarked and transparent so blueprints can be made.

4. Most EDEXCO sheets are specially divided for plotting business data by days, weeks, months and years and contain the right number of spaces for this purpose. EDEXCO curve cards also embody all these features.

TWO WEIGHTS

carried in stock for immediate delivery.

We also sell books telling how to use these papers. Our catalogue "H" describing these is free.

LABORATORY OUTFITS

Containing instruction pamphlets and charting paper to experiment with:

OUTFIT No. 3, on General Business Charting. $2.00
OUTFIT No. 4, on Semi-Log or Ratio Papers. $2.00

Shall we send you one or both?

Educational Exhibition Co. Graphics Headquarters
627 Custom House Street, Providence, R. I.

Ask the Canadian Pacific about Canada — CANADIAN PACIFIC

Bureau of Canadian Information

The Canadian Pacific Railway through its Bureau of Canadian Information, will furnish you with the latest reliable information on every phase of industrial and agricultural development in Canada. In the Reference Libraries maintained at Chicago, New York and Montreal are complete data on natural resources, climate, labor, transportation, business openings, etc., in Canada. Additional data is constantly being added.

Development Branch

If you are considering the establishment of your industry in Canada, either to develop Canadian business or export trade, you are invited to consult this branch. An expert staff is maintained to acquire and investigate information relative to Canadian industrial raw materials. Information as to such raw materials as well as upon any practical problem affecting the establishment of your industry, including markets, competition, labor costs, power, fuel, etc., is available.

No charge or obligation attached to the above service. Business men and organizations are invited to make use of it.

Canadian Pacific Railway
Department of Colonization and Development

Windsor Station, Montreal, Can. — C. P. R. Building, Madison Ave. at 44th St., New York — 165 E. Ontario St., Chicago



STICKERS

Bright, snappy advertising stickers *that stick*—applicable anywhere to anything—economic and persuasive. Every business needs them. Also a complete line of Standardised Stickers ready for shipment in amounts from a thousand to millions. All kinds of labels.

Our price book in colors will save you money. Send for it.

ST. LOUIS STICKER CO.
1625 Washington Avenue — ST. LOUIS

ADVERTISEMENTS

for the next issue of Industry Illustrated should be forwarded as soon after receipt of the magazine as possible. The last date for copy is the tenth of the month preceding date of issue. If your copy has not gone forward please send it at once. Industry Illustrated, 120 West 32 St., New York, N. Y.

Just Suppose--

You had coming to you every month a big bunch of Pictured Progress such as you see in this copy of

INDUSTRY ILLUSTRATED

Wouldn't you give it a hearty welcome?
Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?
And ***wouldn't*** it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

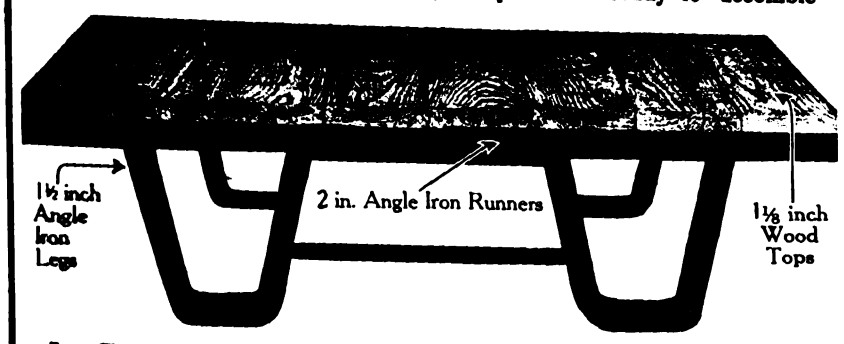
SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name .....
Mailing Address .....
Company .....
Position .....
(Important confidential information—for our own records only)

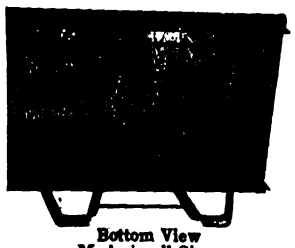
ANNUAL SUBSCRIPTION $1 — In Canada, $1.00; Foreign, $1.50

Digitized by Google

Shipped knocked down with everything complete and ready to assemble



A Stronger, More Durable Platform—
and Less expensive, too!



Bottom View
Made in all Sizes

If you will give us the following information we will quote you promptly on a platform to meet your requirements:

Measurements Desired

Length of top over all.....
Width of top over all.....
Clearance between runners.....
Style elevating truck used.....
Height of truck base when lowered

Important Notice

We ship complete, with necessary bolts, nuts and lock-washers, everything ready to assemble. Top boards of platform finished four sides, cut to length, bored and countersunk for bolts.

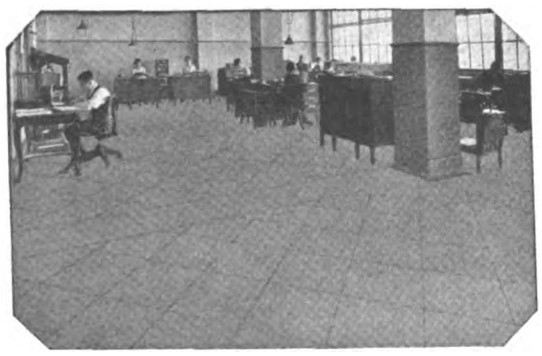
The Enterprise Platform for elevating trucks, hand or electric, is the ***only combination steel and wood platform which is shipped knocked down with everything complete and ready to assemble.*** It is a solid, strong, durable platform that will not break down under heavy loads like the all-wood platform. Yet it costs but little more. And it lasts indefinitely—practically eliminating the expense of repairs and replacements. In final cost it is the least expensive platform you can buy or make—less expensive than many in its first cost, too. Send measurements today and get prices and full information.

ENTERPRISE IRON WORKS
1151 Yandes St. Indianapolis, Ind.

ENTERPRISE PLATFORMS *For Elevating Trucks —Hand or Electric*

MARBLELOID

The Universal FLOORING for Modern Buildings



Marbleloid is a *permanent* composition fireproof flooring material mixed at the factory to embody the definite properties required by its use. If in the same plant Marbleloid Floors are to be installed in an office, laboratory and workrooms, our chemists insure that the office floor will be attractive and resilient, that the laboratory floor will be warm and resistant to stains and chemical action, and that the workroom floor will be strong, non-abrasive and non-slippery.

A Marbleloid Floor has a remarkably low "per year" cost because it lasts as long and requires no painting or other expensive upkeep or repairs. The Marbleloid Company manufactures, installs and guarantees each floor. *If you are thinking of a new building or of replacing an old floor fill in the coupon below and receive definite information.*

THE MARBLELOID COMPANY, 467 Eighth Ave., New York

THE MARBLELOID COMPANY, New York City: Without obligating myself in any way, please submit tentative estimates on the cost of your product installed complete for our building.....; below are the approximate areas involved.
Floor.....Sq. Ft. Sanitary Base.....
Lineal Ft. Wainscot.....Sq. Ft. I have checked the floor troubles we now have.

Our floors are
[ ] New Concrete [ ] Cement Finish [ ] Wood
[ ] Cracking [ ] Cold [ ] Slippery
[ ] Dusting [ ] Splintering [ ] Unsanitary
[ ] Noisy [ ] Rough [ ] Rotting
Name.....
Firm.....
Address.....
[ ] Please send 32 pr... et

(*Continued from page 70*)

which have sufficient pitch to drain rapidly. When we come to large expanses of flat, or nearly flat area, however, the problem is a different one. In such cases, shingles are out of the question, as are tiles. It is perfectly feasible to use sheet iron or steel, soldering the individual sheets into one immense sheet—though this process is not used as extensively as it was a decade or two ago. From the standpoint of both first cost and satisfactory service, the built-up type of roof has found increasing favor for this purpose. Examples of three different kinds of built-up roofs are shown among the illustrations accompanying this article. Such a roof may be of waterproofed concrete on steel; of built-up layers of asbestos felt and asphalt; or of asphalt alone, over concrete or even over wood. The least expensive in first cost is the felt roof with tar and gravel, over roofing boards; while the nearest approach to freedom from repair lies with either the asphalt or the asphalt-asbestos built-up roof over concrete.

To dismiss the various kinds of prepared roofing, with the brief mention accorded them earlier in the course of this discussion, would create the impression that these are of merely secondary importance. On the contrary, a very large proportion of new buildings are being roofed without recourse to the old standby materials; while the whole immense field of operations in reroofing existing buildings depends primarily upon these newer manufactured roofings.

The earlier forms of prepared roofings sought lightness, ease of application, absolute protection against water, and a surface that would both resist water and stand up under the heat of the sun's rays. These characteristics were obtained by impregnating a felt base with pitch or asphaltum, and in some cases by surfacing with a rubberized compound.

With lightness and ease of application attained, the question of fire-hazard began to receive attention. And here the vision of some farsighted manufacturers did its part; because only through the foresight and energetic work of these manufacturers was as-



A New SARCO costs Less than to Repair Other Traps

The numerous parts in both float and bucket traps wear out—are constantly needing repairs, replacement and adjustment. For example, the float. To put in a new float alone costs around $12.00 besides the labor. And the cost of other new parts is often almost as high.

Now consider this fact—in all sizes under 1 in., you can buy a complete and brand new Steam Trap Sarco for considerably less than $12.00, and larger sizes for only a little more.

STEAM TRAP SARCO

Nine times out of ten it is cheaper to scrap a float or bucket trap and replace it with a brand new Sarco than to pay for repairs or new parts for the old trap.

It is less bother, too. A new Sarco can be installed without any building up, without any platform or support of any kind. And the Sarco takes far less room—fits in like an elbow at any point in the line and at any angle, without any change in the piping.

Because it has only one moving part—and that with a simple and direct action that practically eliminates wear—a Sarco will outlast any other trap ever made. And a Sarco practically never requires adjustment or repairs or attention of any kind.

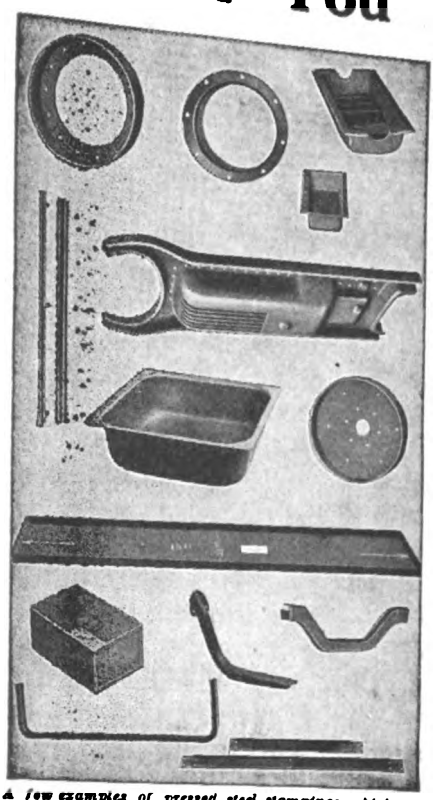
Made in sizes from ⅜ in. to 3 in., and guaranteed for any given pressure up to 200 lbs.

Sold on 30 days' free trial. Send for Booklet R24.

Sarco Company, Inc.
236 Broadway
New York City
Buffalo Cleveland Philadelphia Detroit Chicago

Digitized by Google

Let Us Make It For You



A few examples of pressed steel stampings which we have made for prominent companies

YOU will find our equipment for making pressed steel stampings unsurpassed in completeness. We have presses and machines of all kinds, capable of very heavy pressed steel plate work as well as the lighter sheet metal stampings. Our facilities for electric welding are unusually large, including best modern methods. We have complete machine shops for making dies, tools, etc.

Among our products are Truscon Alloy Steel Platforms and Boxes, Conveyor Parts, Truscon Alloy Steel Flasks, Bottom Boards, Core Plates, Core Racks, Gaggers, Ladles, etc., etc. Truscon Alloy Steel Products for foundries and for handling material are sturdy, durable and economical.

Truscon Service Yours Without Obligation

Our engineering force is always at your disposal. In designing your steel parts its advice and co-operation can save you money or give you a better product. The long experience of the Truscon organization will also be of value to you in improving your products by using pressed steel in place of other materials.

Write for literature and quotations

TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO

Warehouses and sales offices in principal cities

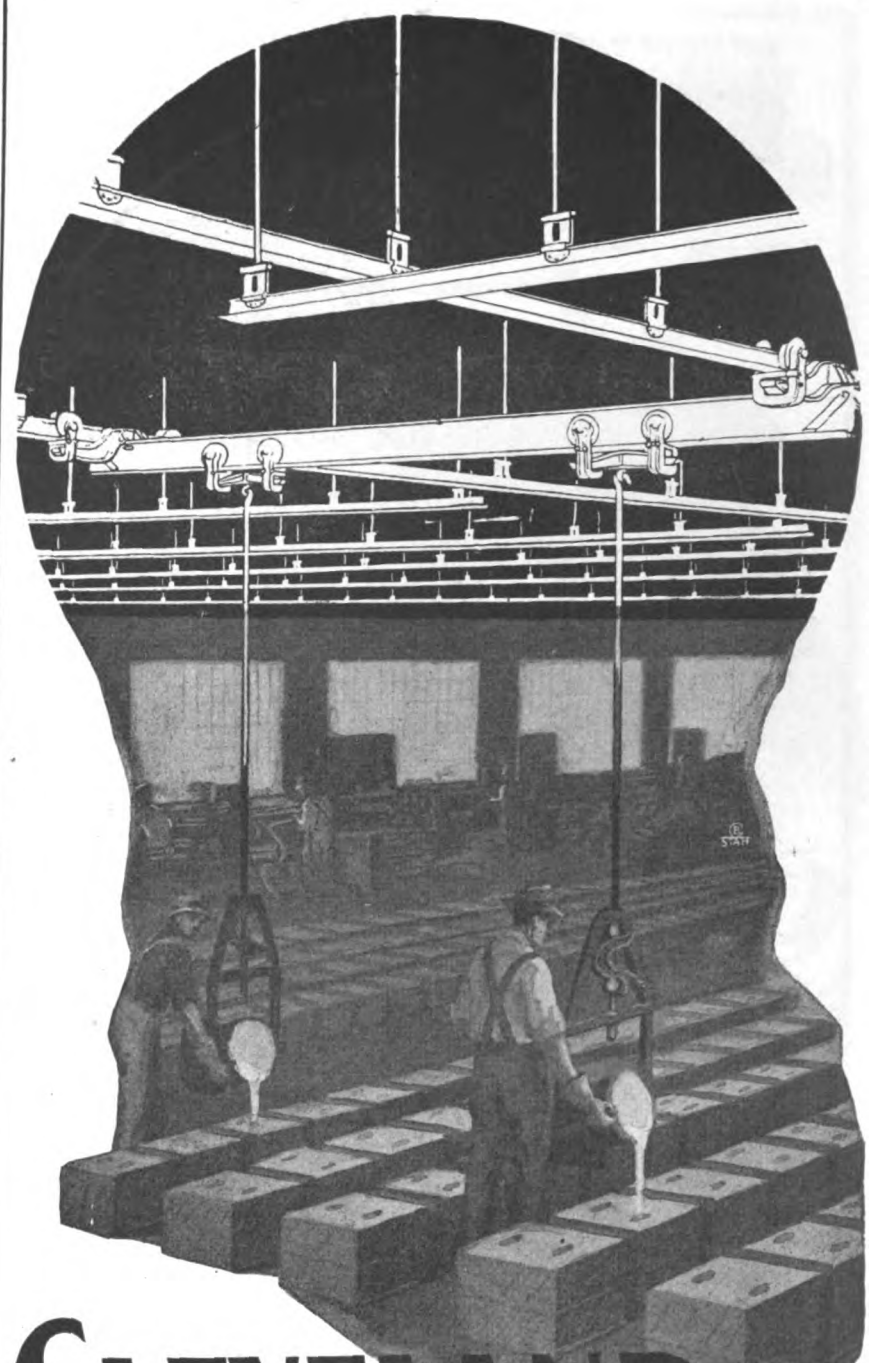
TRUSCON ALLOY PLATFORMS STEEL

bestos—that marvelous product of nature—made available for use. But a few decades ago, asbestos was a little-known curiosity; today, besides its manifold other uses, asbestos is practically the foundation on which is built the whole industry of fireproof manufactured roofing.

Eliminating from consideration the flat roof of large area—which has been discussed here, a few paragraphs back—whether the building under consideration be a big factory, built to endure, or a small temporary tool house or construction shed (providing only that the roof has a pitch of at least 1½ inches to the foot), there is available a ready-to-lay roofing that will meet every ordinary requirement. Specific cases, such as in some chemical plants, or the like, where chemical fumes must be reckoned with, may dictate the choice of tiles or sheet metal; but otherwise the ready-to-lay roofing can compete on terms of equality with any other type.

It is the ease of application, and the comparatively low cost of installation, that has made this type of roofing assume such importance in recent years. But more than that, the manufacturers of these prepared roofings have developed a field of great importance to the factory owner. Realizing that a large element of the cost of re-roofing a building lay in removing the old roof, far-sighted manufacturers are pointing out that their product can be applied right over the old, worn-out shingles—and not merely suggesting, but proving that it works.

The emphasis which is placed upon the limitation of the numbers of immigrants as a means of restricting the labor supply is the outgrowth of a wrong conception of the economic consequences of such a policy. A scarcity of labor which unduly forces up wages is not socially defensible merely because the nominal wages of a large part of the workers are made higher than they would be without the restrictions upon numbers. The extra costs are widely distributed and are borne in large part by the wage-earners themselves. — *The Guaranty Survey.*



HAND OR ELECTRIC
CLEVELAND TRAMRAILS

Use the Ceiling---

it too should be a profit earner.
Cleveland Tramrails will enable you to do your trucking on the ceiling—to save floor space—to eliminate expensive manual labor—and to speed up hoisting and conveying of materials.
It's a profit earner wherever used.

Send for our catalog.

Cleveland Electric Tramrail Division
of
The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

SALES OFFICES

50 Church St. New York City | *149 E. Larned St. Detroit, Mich.* | *Farmers Bank Bldg. Pittsbrgh, Pa.*
1418 First National Bank., Chicago, Ill.

Digitized by Google



Suppose

You fire an employee—would his work be authentically recorded or counted—could you pay him off instantly?

If you had

ROOT COUNTERS

ingeniously installed you could.

They are the most versatile and dependable little helpers you can have around your plant.

We will gladly give you the benefit of our experience as to the best application in your shop.

We find new useful uses every day.

What would YOU like to KNOW?

ROOT
BRISTOL, CONN.

Americanization in Industry

BY FRED H. RINDGE, JR.

THE term "Americanization" is not altogether a happy one. It smacks of compulsion and paternalism and is therefore resented by our foreign people and by the countries from which they come. However, it is terse and generly understood; so we continue to use it. We are coming to realize, moreover, that the most *thorough* Americanization can be achieved in industry as well as in the 3,000 communities boasting 100 or more foreigners, by *attraction*, rather than by compulsion. We are learning that we can even Americanize more *rapidly* when we have an intelligent appreciation of the gifts as well as the problems brought by those from other lands.

Graham Taylor well says: "Let us fraternize with our foreign-born neighbors and affiliate their great racial organizations. Let the widest and most sympathetic hearing be given by the English-speaking Americans to the expression and interpretation of the spirit and aspirations of all foreign-born and foreign-speaking peoples among us. Let the press give widest publicity to their struggles here and abroad for liberty and progress. Let their spokesmen be invited to speak at American patriotic meetings to interpret them to Americans, while America is being interpreted to them. Thus through our own and their own speech and song may we best impress and be impressed with the worth and glory of American citizenship."

If our dealings with foreign employes in the great industries could be based on ideals like these they would be far more effective!

There are approximately 14,000,000 aliens of 35 different races speaking 54 languages in America today—not to mention 22,000,000 more of foreign parentage. What a challenge! Some industries in America have as high as 80 per cent of their employed force foreign-born. The foreigners do seven-tenths of the bituminous coal mining, seventy-eight per cent of all the work in the woolen mills, and nine-tenths of the labor in the cotton mills. They make nineteen-twentieths of all the clothing, more than half the shoes, and refine nearly nineteen-twentieths of the sugar. I visited one large industry recently which employed 20,000 workers, more than half of them foreign. Yet that plant's entire Americanization program consisted of four small classes in English. Such amateur tinkering with a great problem is unworthy of American business.

Much of the Americanization problem must be solved in the realm of industry. But we will *never* solve the problem by a few English classes and an occasional scream of the American eagle in a noon-hour shop talk! What the immigrant laborer needs is fair treatment, decent working, living and leisure conditions, reasonable hours and wages, and a little common-sense appreciation of his qualities as a *man*, rather than contemptuous remarks as to his inefficiencies as a "wop" or "Polak!" As Theodore Roosevelt once said: "We must exactly reverse our former policy. Let us hereafter treat each immigrant not as a labor unit, but as the possible father of the American citizens with whom our children and children's children are to inherit the land!"

We should begin with a different kind of reception committee than we now permit at ports of landing. The immigrant's first impression are formed by his contact with grafting porters, taxi-drivers, hotel runners, fake employment agents, dishonest bankers, sharks and radical agitators. No wonder he comes to our shops and mines sore and suspicious! How important it is therefore that our factory employment departments should at once impress him

(Continued on page 77)

Digitized by Google

"Mastering Power Production"

A Most Unusual Book

By Walter N. Polakov

455 pages—138 illustrations **Red cloth—$5 postpaid**

"Mastering Power Production" shows what can be done in the way of reduced costs, more efficient operation, expanded production and better human relations—in the power plant and throughout the factory—BY TELLING HOW IT HAS BEEN DONE in the author's own extended personal experience.

No other book has ever been written that analyzes and attacks the whole problem of production by power-driven machinery from so many angles—all of them bearing directly on the conditions now confronting industry.

It treats in a unique, thoroughly readable, intensely practical manner the engineering, managerial and economic fundamentals underlying the better uses which can be made in every plant of existing equipment, materials and personnel, and as such will be interesting and useful to every engineer, manager, economist and student of human relations.

CONTENTS

Introduction—The Descent of the Principle of Production for Use.

1. The Power Industry as an Economic Factor.
2. The Location of Plants.
3. The Equipment of Plants.
4. Mastering Materials.
5. Mastering Maintenance.
6. Mastering Labor Problems—Conditions.
7. Mastering Labor Problems—Compensation.
8. Mastering Processes.
9. Mastering Records.
10. The Analysis of Expenses.
11. Power as a Commodity.

Index.

"Mastering Power Production" Tells Exactly How

1. **In a public Utility Plant the operating expenses were actually reduced one-third.**
2. **An electric railway cut its operating expense per kilowatt from over three-quarters of a cent to less than half a cent.**
3. **Many manufacturing concerns have reduced their power bill to one-half of its former figure.**
4. **Applications of its methods in manufacturing concerns of national reputation have resulted in savings amounting to several millions annually.**

And Hundreds of other "HOWS"—Big and Little

The Author

has served the New Haven Railroad as superintendent of power; the Board of Estimates and Apportionments of the City of New York as expert engineer for municipal plants; and, during the war, the United States Shipping Board Emergency Fleet as power expert. In the public utility field he established a record for economical operation, both on electric railways and in central stations, his pioneer work for the Penn Central Light and Power Company particularly receiving much attention.

Send No Money Now

Simply fill in the coupon and mail it at once. This book will be forwarded at once. If you decide to keep it, you may remit $5 within 30 days. Get the coupon off in TODAY'S mail.

Free Examination Coupon

The Engineering Magazine Company,
120 West 32d Street, New York.

Send me Polakov's new 455-page book, "Mastering Power Production"; I shall either return it in 10 days, or remit the price, $5, in 30 days.

Name .....

Street .....

City ..... **State** .....

Digitized by Google

REG. U.S. PAT. OFF.
TRADE JENKINS MARK
Jenkins Bros

This Rapid Action Valve
gives instantaneous full flow



Fig. 720 Jenkins Brass, Rapid Action Valve

FULL opening with one pull of lever. Stays open automatically. Closed by a slight pull of lever, without shock or water-hammer. Stops water waste—saves time. For wash wheels in laundries, for testing stations, bottle washing establishments, shower baths, dye works, hat factories, and any use where a dependable, quick opening valve is required.

Send for descriptive folder

JENKINS BROS.

80 White Street, New York, N. Y.

Jenkins Valves
SINCE 1864

EFFICIENT HEATING

Demands Radiators so constructed that every square foot is prime heating surface.

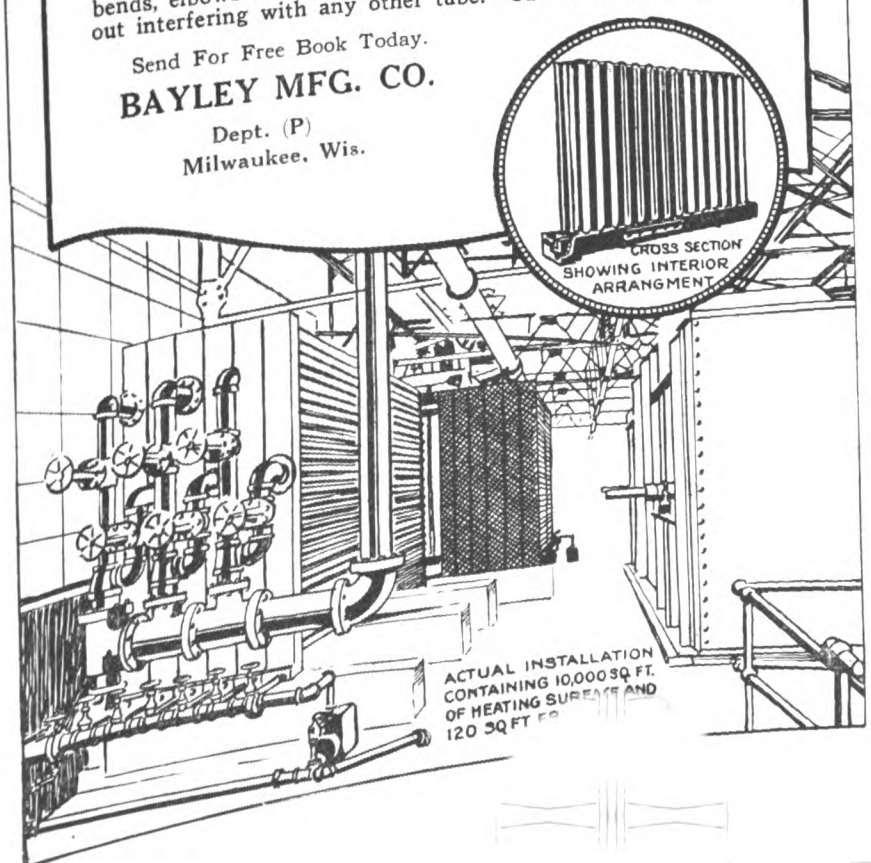
Bayley CHINOOK HEATERS

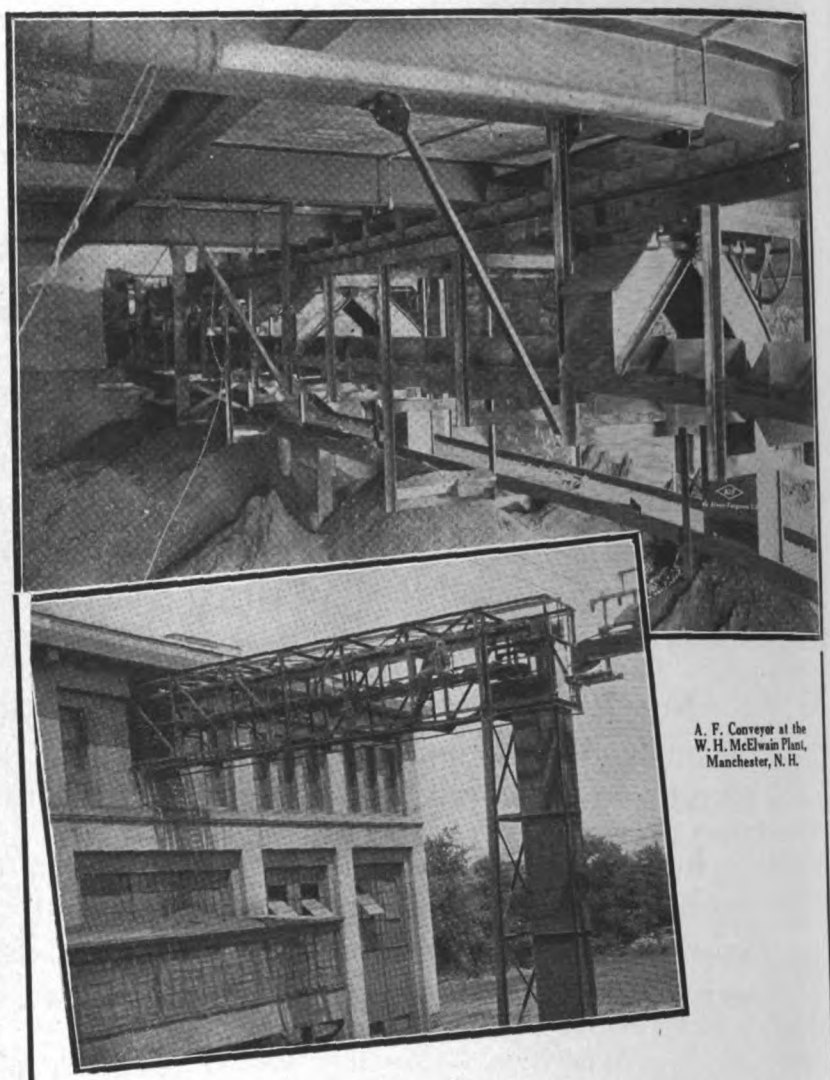
are built on the "tube-Within-A-Tube" principle, every tube a complete radiator in itself, free from water hammer, return bends, elbows and nipples. Any tube can be removed without interfering with any other tube. Can be shipped K. D.

Send For Free Book Today.

BAYLEY MFG. CO.

Dept. (P)
Milwaukee, Wis.





A. F. Conveyor at the W. H. McElwain Plant, Manchester, N. H.

Handling Coal Mechanically Cuts Your Power Costs

You can do what this company did to solve the problem of high labor costs in handling coal.

From the cars to the bins—from bins to the hoppers and down the chutes to the boilers

A-F **Conveyors** A-F

handle the coal automatically. Thousands of dollars saved annually in labor costs and the cost of coal per K. W. brought down to the minimum.

An A. F. Conveyor installation in your plant may be the solution to your problem of lower costs in production and lower handling costs.

A. F. Conveyors are built to conform to *individual* requirements and the A. F. Engineering Service Bureau will help in the solution of transportation difficulties. These men have the experience gained in thousands of installations. It will pay you to write and put your problem up to them. This service places no obligation on you.

Write for catalog

***The* Alvey Ferguson Co., Inc.**

Cincinnati, Ohio

CONVEYING MACHINERY A-F TRADE MARK REG. U.S. PAT. OFF.

Digitized by Google

(Continued from page 74)

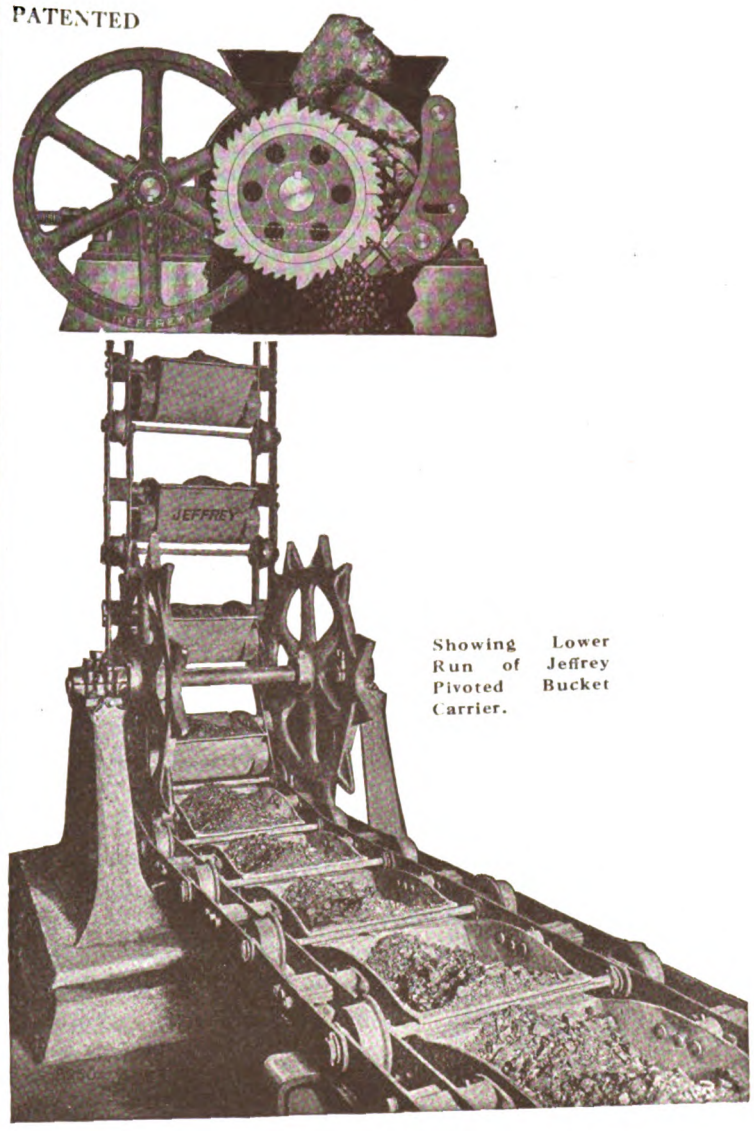
differently! There he should find sympathy, understanding and friendliness, which will at once tend to breed an attitude of loyalty and efficiency. Such treatment will pay in dollars and cents! And after he gets to work the foremen should look upon him as an asset rather than a liability, encourage and help in his new job and make him feel at home. Is that too much to expect in this age, when the leader rather than the driver of men is so much needed? Every alien who arrives in the U. S. A. has come because he believes America is a better place to live and work than his homeland. Are we going to disappoint him?

Early in the game of making his way in America, the immigrant, through ignorance and misunderstanding, is made to feel the hand of the law. He has heard a great deal about the Declaration of Independence and the Constitution, but it is difficult for him to make their ideals jibe with the treatment he receives at the hands of the police and minor courts. Knowing little of the language, he is always at a disadvantage and the interpreters are all too frequently unreliable grafters. Thus he may again have disagreeable experiences which it will take years to efface. Similar treatment is often received in the shop, when the boss curses him because he does not understand. Some of the first English words he learns are therefore swearwords!

If immigrant workmen possess any national ability, it is generally suppressed. Again and again I have met men who had been engaged in for years in most menial labor in an industry, but who spoke fluently several different languages. All they needed was encouragement, a chance for self-expression, a little English instruction and they would have proved invaluable assets. As it was their ability was unrecognized and unused. Many of them have come from lands steeped in rich history and tradition, and with an appreciation of art, literature and music, but all too often we repress or kill it. Over in Italy last year a returned immigrant said to me: "The trouble with America is that hardly any one there appreciates art. Here even the common people love art." I realized better what he meant when I noticed that my bootblack in Naples always had a bouquet of flowers in his broken bottle, and that even the street cleaners stopped to admire the painting and sculpture in the store windows. Is it necessary to stifle appreciations like these in order to secure "efficient labor"? I think not. It has been proven beyond doubt that *efficiency depends considerably upon happiness.* And how can any man be happy unless he gets a square deal, occasional encouragement and an opportunity for natural self-expression?

I believe also that such fair treatment will hasten the desire for naturalization. There are still more than 6,000,000 foreign-born who are not citizens. It is interesting that

PATENTED



Showing Lower Run of Jeffrey Pivoted Bucket Carrier.

A Combination That Insures

—Low Cost Handling of Both Coal & Ashes —A Constant Supply of Properly Sized Coal

The Jeffrey Single Roll Crusher enables the power plant to crush its own coal, at a moderate cost, for stoker use, where lump or unsized coal only is available, and where stoker sizes cannot be secured from the mines.

The Jeffrey Pivoted Bucket Carrier has a working principle which ordinarily combines in the one carrier the work of at least one elevator and two conveyors, in that it handles both coal and ashes. Its economical installation is usually for a capacity of 50 to 175 tons coal per hour.

A wide range of capacity requirements is met by Jeffrey Standard Coal and Ashes Handling Equipments; Track Hoppers; Crushers; Feeders; Bucket Elevators; Conveyors of the Bucket, Belt, Steel Apron, Scraper, Drag Chain, Spiral and other types; Traveling Weigh Larries; Skip Hoists; Portable Loaders and Unloaders, etc.

Let Jeffrey Engineers diagnose your coal and ashes handling requirements.

The Jeffrey Mfg. Co., 946-99 North Fourth Street **Columbus, Ohio**

New York, 2008 Hudson Terminal Bldg. — Chicago, 853 McCormick Bldg. — Pittsburgh, Rea Bldg., 622 Second Ave. — Montreal, Canada, Power Bldg.

Locations of Other Jeffrey Sales Representatives

Detroit, Mich., 455 Book Bldg. — Milwaukee, Wis., M. & M. Bldg. — Boston, Mass., 141 Milk Street. — Cleveland, Ohio, 828 National City Bank Bldg. — Denver, Colo., 1751 Wazee Street. — St. Louis, 606 Pontiac Bldg. — Los Angeles, Cal., H. W. Hellman Bldg. — Charleston, W. Va., 914 Kanawha Street. — Scranton, Pa., 518 Union National Bank Bldg.

JEFFREY

MATERIAL HANDLING MACHINERY

Digitized by Google

.73 per cent of these are alians; 11.85 per cent Pol-ı; 11.34 per cent British; .16 Russian; 6.92 German; 38 Canadian; 5.14 Austri-ı; 3.94 Hungarian; 2.89 wedish; 2.82 Czecho-Slovak-n; 2.12 Greek; 1.86 Jugo-ıavian; 1.76 Norwegian, and 5.79 per cent from other nds. It is easy to blame for-gners for their slowness in ecoming citizens, but are we ithout blame ourselves? A areful study of the situation eveals that the number of our aturalization officials is en-rely inadequate, that the lerks are often woefully in-fficient, and that our laws are umbersome and antiquated. t seems as if any person who an prove himself of good haracter, loyal to America nd having resided here a cer-ain number of years should e privileged to take his exam-nation. But not so! We hrow up barriers as to color nd race, we insist on "the ame two witnesses" for two lifferent appearances, we hrow down perfectly well-in-entioned human beings for a lozen senseless technicalities nd then growl at the foreign-r for not becoming a citizen!

And the worst of it is—after such experiences as the immigrant passes through—we cannot be assured that he is an *American*, even after he *does* secure his "second papers!"

Il Trentino, an Italian paper, well says:

"If by Americanization we mean the spiritual fusion of all groups and races which have immigrated to America in a common national impulse, a harmonius social expression, the adoption of the country's laws and of its language, the enjoyment of equal rights and of an equal respect, it is well and good. But, if by Americanization we mean the undoing and unlearning of the best characteristic racial traits, the betrayal of the natural affections for the country of origin, the obliteration of its traditions and customs, it is utterly wrong and defeats what should be its real end. Every 'foreigner' who comes to us brings something which can make America a richer and better place. If we wish him to respect us, we must respect him. When mutual respect is established, the task of Americanization becomes an easy thing. Assimilation based on direct or indirect violence upon the language, customs and sentiments of the foreigner, is dangerous to real Americanization. It will make hypocrites, not sincere Americans."

There are over one thousand other foreign language newspapers published in the United States and read by millions of immigrants. Fortunately many of them are printing some very sensible material on this whole subject of Americanization. *Glasnik Istine*, a Croatian paper, indicates that "Merely acquiring final papers does not make one American, unless he means to serve this country as he was willing to serve his original country. The naturalization oath does not mean that the one who takes it shall forget all his past. It means simply that there is only one political allegiance and that this is to the government of the adopted country."

Ameriska Domovina, a Slovene paper of Cleveland, takes a slap at some of its readers thus: "They are wrong who think that because they speak English, wear American clothes and vote at elections they do not need any Americanization. Americanization is something more important and involves far greater duties. The first and greatest duty is to love this country, to love it consciously and profoundly and to be ready to give away one's life for it, for the aims and teachings of the American constitution which is still the model constitution of the whole world."

Paivalehti, a Finish daily, resents compulsory Americanization: "Fanatics and those who do not understand the situation are ready to require that all national endeavors of immigrants be suppressed, their newspapers and the use of their languages, even in the church services prohibited. Such intolerance would not bear good fruit. Through their own national activities the immigrants develop themselves and raise their social status. We do not believe that oppressive measures which have been proposed would be supported by thinking people and those who are acquainted with the situation. Americanization must not be achieved

Digitized by Google

through coercive measures in an imperialistic manner but only by education. Every one must be left free to decide whether he wants to become a citizen of this country or to remain a citizen of his native country. Coercion would be contrary to the American spirit and the Constitution which guarantees freedom to every resident, be he citizen or alien."

Rekord Codzienny (Polish) appeals to its readers in these splendid words: "What our brothers demand of the foreign-born who have settled in Poland, is exactly what the sensible and upright American patriot demands of us, and has a right to demand. All the suspicion and ill-will towards the foreign-born in America is due to the fact that a certain number of aliens who come to this country, beyond the necessary labor for their daily bread, take no interest whatever in its institutions and have no desire to familiarize themselves with the country they live in . . . This type of alien is disliked by Americans and is suspected by them, very often unjustly, of disloyalty to this country . . . Not that he should forget his native country altogether—no one has a right to demand that, for devotion to and love for one's native country is a natural virtue instilled in our hearts by the Creator. All that upright and sensible Americans —and these are in the majority—want of us is that we learn the language of the nation of which we are a part, acquire its way of thinking, become familiar with its institutions, take active part in its social and political life and be loyal to their ideals. Such an immigrant is always a desirable and valuable addition and will be respected by Americans. Let us act in America as we would have the foreign born act in Poland."

These significant quotations clearly indicate the possibilities of the foreign language press for good or evil. Contrary to the general belief on the part of many business men and industrial leaders, the great majority of these papers are not radical. If properly cultivated by our industries they can be increasingly used to spread right ideals of industrial justice and Americanization. This is particularly important when one considers the millions who read these publications!

Before the war we averaged 1,000,000 immigrants per year for a decade, but our present restriction laws cut the number down to 357,803 for the fiscal year ending June 30. Inasmuch as each country can send only the equivalent of 3 per cent of its population in the United States in 1910, the effect has been to favor races from Northwestern Europe, which have been judged to be more readily assimilated.

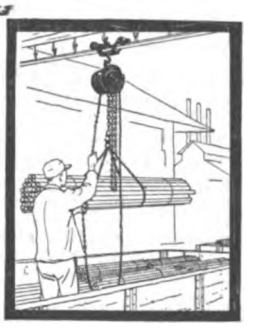
From an industrial viewpoint the most interesting facts are that recent immigration has been largely females and old people and that during the past fiscal year 3,091,556 aliens arrived, but 198,712 left the United States. Furthermore, 32,724 of the new arrivals were designated as "laborers," while 100,058 laborers returned to the Old World—a loss of 67,334. This clearly reveals the major reason for our present labor shortage in many industries. We must face the facts that decreased production, due to lack of unskilled labor, may lead to higher prices and also poorer jobs for workers who ordinarily are capable of more highly skilled labor! Whether Congress will modify present restrictions remains to be seen. "Without unskilled labor," says the New York Board of Trade, "the heart beat of our country's activities will stop." United States Commissioner of Immigration, W. W. Husband, says:

"I am inclined to the opinion that it would be entirely possible to continue the basic number of immigrants at a minimum, and then provide for modifications that would meet the actual needs of the country. We might develop administrative machinery that would serve to invite those actually needed, whether for farming, for industry or for any other activity in the United States."

Certain it is that before long this country will be forced to work out a thoroughly comprehensive and scientific immigration policy.

The amazing changes which have taken place in America since 1880 are due in no small measure to the immigrant. In

MATERIAL



Chain Hoists for All Purposes

¼ to 30 Tons Capacity

SAFE DEPENDABLE ECONOMICAL

Our catalog will interest you

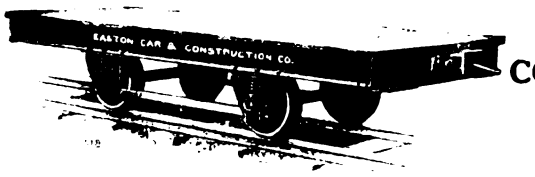
WRIGHT

Lisbon, Ohio



EASTON CARS

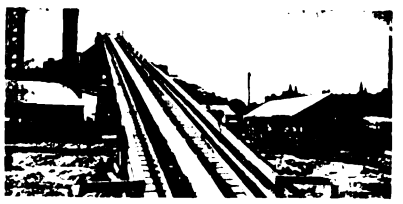
EASTON CAR



COMPLETE INDUSTRIAL RAILWAY EQUIPMENT

EASTON CAR AND CONSTRUCTION CO.

Main Office & Works: Easton, Pa. Branches in Principal Cities



Robins Conveying Systems

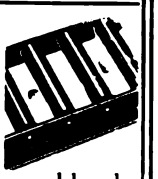
complete with all accessories, for the rapid and economical handling of bulk and package materials.

Write for Handbook of Conveyor Practice

ROBINS CONVEYING BELT COMPANY

New York Chicago Pittsburgh Boston

"*Handling*" is the wrong word



when applied to Dow Conveyors. *Handling* suggests *carrying by hand* whereas the very purpose of Dow Conveyors is to dispense with costly human effort in moving parts and finished products from one place to another. Dow Conveyors (Gravity and Power) do away with porters and enable the skilled mechanic to devote *all* of his time to production instead of intermittently walking the floor. Many manufacturers are not aware of the time-labor-and money-saving ability of Dow Conveyors. The facts are yours for the asking. The Dow Co., Incorporated, Louisville, Ky.



DOW CONVEYORS

MATERIALS HANDLING EQUIPMENT THAT CUTS COST TO BEDROCK

HAISS





Portable Belt Conveyors—Truck Loaders

Catalog on Request

THE GEO. HAISS MANUFACTURING CO., Inc.

146th St. & Canal Place, New York

HANDLING

Digitized by Google

MATERIAL



AMERICAN INDUSTRIAL
Frictionless
DOUBLE BALL and ROLLER BEARING CASTERS

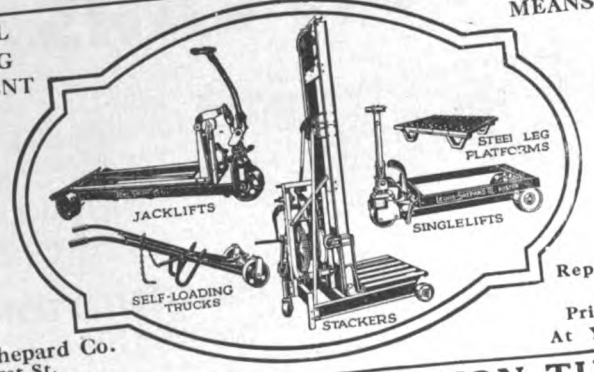
The American Caster swivels on balls, rides on balls and rolls on rollers.
ABSOLUTELY WILL NOT drag sidewise.
Rigid casters to match.

If you are not getting satisfactory service from the casters you use on your industrial trucks or product,
Try the AMERICAN.

PHILIP A. HELLER & SONS
213 West State Street
Detroit, Mich.

MATERIAL HANDLING EQUIPMENT

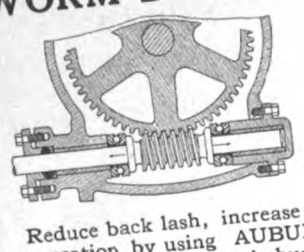
LEWIS-SHEPARD MEANS LABOR SAVING

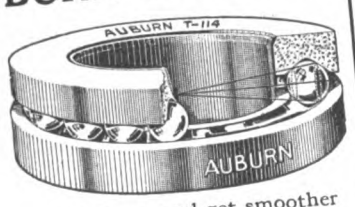


Made by
Lewis-Shepard Co.
582 E. First St.
BOSTON 27, MASS.

Representatives in the Principal Cities At Your Service

WORM DRIVES OPERATE MORE SMOOTHLY WITH AUBURN THRUSTS





Reduce back lash, increase the life of both Worm and Gear, and get smoother operation by using AUBURN BALL THRUST BEARINGS. Tell us your problem and get the Auburn Answer. Ask for Catalogue.

STEEL BRASS AND BRONZE BALLS
AUBURN BALL BEARING COMPANY
20 INDUSTRIAL STREET ROCHESTER, N. Y., U. S. A

Are your Costs
Live News or mere History?
G. Charter Harrison's
"Cost Accounting to Aid Production"

presents a definite, workable program for bringing costing into line with today's industrial thought and practice.

It thoroughly works out methods for including costs among the known production factors planned for ahead of the process; for bringing them under the same control and inerrant forecasting with which we now make provision for the elements of time, labor, machines and material—to be reshaped, if necessary, while there is yet time to turn loss into profit.

Since its first publication, in March, 1921, thousands of copies of the book have been sold. Many business schools and technical colleges have adopted it as a textbook. Executives and cost accountants in widely diversified industries have hailed it as a vast step in advance of the hardly 50%-efficient cost system of today.

251 pages, 54 tables and diagrams; red cloth
Price, $5, Postpaid

Engineering Magazine Co.
120 West 32 St., New York.

Send me a copy of G. Charter Harrison's book "Cost Accounting to Aid Production."
Name .....
Firm Name .....
Street No. .....
City, State .....

HANDLING

1880, only 28 per cent of our entire population were engaged in industrial occupations, while today the proportion is over 52 per cent of many nationalities. In 1880 only five states had a major portion of their population in cities, while now this is true of fifteen states. It is well known that the foreigners congregate largely in these cities.

During these same years the number of wage earners has increased 296 per cent and the value of manufactured goods has increased 1180 per cent. This great growth would have been utterly impossible without the foreigner! Let us be fair enough to admit that.

In any consideration of the Americanization problem, we cannot overlook the 22,000,000 people of foreign parentage. Many of these are boys and girls whose criminality is nearly three times as great as that of their parents! This is because they have so frequently been isolated in foreign communities, have left school early and come into contact with a cheap imitation of real American ideals. On the other hand, many have pulled away too rapidly from parental authority, scorned the "wops" and "dagoes" and, in trying to rush into Americanism, have made mighty poor citizens!

Our mines and factories must assume considerable responsibility for this problem inasmuch as they employ so many of foreign parentage. It is amazing that about one-fourth of all the children in the United States of America live in the homes of our foreign-born! We must find a way to give them a new respect for the ideals and heroes of their parents, as well as a more real comprehension of American ideals.

There is considerable encouragement in the fact that while 13.1 per cent of our foregn-born are illiterate, only .8 of one per cent of these second generationists are illiterate, a far better record than that held by children of native parents!

There are over 2,000,000 alien white women over 21 in the United States. The new Cable Act, signed September 22, 1922, grants independent citizenship to women, and makes it possible for women married since that date to become naturalized even though their husbands do not. This law puts a corresponding burden upon industry, and our educational and social agencies, for these women must now be educated and prepared for citizenship.

The war thrust large numbers of immigrant women into industry, and many are still there. According to the last census, 40 per cent of the total female population were foreign-born and 60 per cent of bread-earning women were foreign-born!

There are but few in Southern industry except in certain localities—as in the garment industries of Kentucky. Kansas has a number in the meat and poultry packing plants. A large number are in the candy factories of Chicago and Philadelphia, the clothing industry of New York and Baltimore, and in many other industries of our large cities. A surprising number still do "home work," often under unsanitary conditions. In fact, foreign women frequently do the hardest and dirtiest work because of lower standards and because they are obliged to accept almost anything to help expand the family pocketbook.

Altogether the immigrants in America sent back to Europe over $500,000,000 of their earnings last year. But this is small cause for alarm. The sum per capita is less than 4 per cent of the total wealth produced by them. Since it was their own hard earned cash, they had a perfect right to send it away if they desired to do so.

The importance of the proper reception of the foreigner by the employment manager and sympathetic handling by the foremen have already been indicated. A fair deal to the foreigner makes for happiness, stability and efficiency, and inevitably reduces labor turnover. It is not so easy to hold foreign labor as it was before the war. Sensible methods of plant Americanization and assimilation are therefore more vital than ever.

An adequate program of Americanization—in the best meaning of the word—is a legitimate charge against operating expenses. Even if the foreign laborer only remains for a while and then returns to Europe, his employer

Digitized by Google

should see to it that he returns with American ideals and as a booster for American trade and industry. I recently met hundreds of returned emigrants in twenty-three countries of Europe who had gone back with the worst impressions and with the reverse of these ideals.

Plant Americanization Committees, composed of different nationalities, help distribute the responsibility of giving every opportunity for the learning of English and Citizenship. Classes may be held at noon hour, just after hours, in the evening or on Company time. Many companies give rewards or promotion to those who attend faithfully and "pass" successfully. Foreign leaders of intelligence and ability can be of great help. One manufacturer recently said, "These Italians are fine chaps. We have no trouble with them, they are good workers, and appreciate everything we do for them." Another in the same city remarked, "That company has a better bunch than we have. Our Italians are no good!" Investigation revealed that it was not the Italians but his method—or rather lack of method—of Americanization which was no good.

Many plants find that it pays in every way to give free legal advice, which often results in rescuing foreign employes from loan sharks and others who prey upon them. Thrift campaigns, lectures on various subjects, social gatherings of foreign and native born, picnics, first-aid and safety promotion, athletic leagues, community clean-up campaigns, clubs for foreign boys, classes in home economics for women are all tremendously worthwhile.

Special emphasis should be given to those types of activity which develop self-expression. The celebration of foreign as well as American holidays, pageants, folk dances, mass singing of national songs, dramas by foreign playwrights, exhibits of native costumes or handiwork are a joy to the foreigner and an education to the American!

Said a superintendent recently, "These plant sings have knit our whole plant together. And even the foreigners now call the officials by their proper names instead or just 'the boss.'" A singing man seldom grows weary; thus music may help increase shop efficiency.

If industrial executives and shop officials were to look at this problem only from the selfish viewpoint, they would agree that it pays to spend time, energy and money on a thoroughly worthy program of Americanization. After all it is a great coöperative undertaking in real democracy and internationalism, and what two things could be more important in the present stage of the world's history?

For photographs in this issue, not otherwise credited, we are indebted to the courtesy of the following:

ROOFING THE OLD AND THE NEW BUILDINGS

American Cement Tile Co.
The Barber Asphalt Co.
Berger Manufacturing Co.
Federal Cement Tile Co.
Johns-Manville, Incorporated
Penn Metal Company
L. Sonneborn Sons, Incorporated

STORING AND HANDLING MATERIALS IN THE PLANT YARD

Barber-Greene Company
R. H. Beaumont Company
Brown Hoisting Machinery Co.
The Browning Company
The Byers Machine Co.
Cleveland Crane & Engineering Co.
Detroit Hoist & Machine Co.
Dow Company
Elwell-Parker Electric Co.
Godfrey Conveyor Co.
Geo. Haiss Mfg. Co.
Industrial Works
Jeffery Manufacturing Co.
Link-Belt Company
Louden Machinery Co.
Maris Bros., Incorporated
Northern Engineering Works
Pawling & Harnischfeger Co.
Portable Machinery Co.
Shepard Electric Crane & Hoist Co.
Universal Crane Co.
Whiting Corporation

PICTORIAL NEWS OF THE MACHINERY WORLD

The Baker, R & L Company
The Byers Machine Co.
Industrial Works
Ingersoll-Rand Co.
International Motor Co.
The Kent Company
Orton & Steinbrenner Co.
Pangborn Corporation
Specialty Engineering Co.

PROFIT POSSIBILITIES CAUGHT BY THE CAMERA

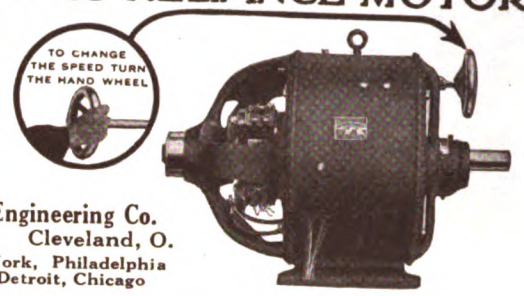
The Cleveland Tractor Co.
General Electric Co.
Ingersoll-Rand Co.
Stow Manufacturing Co.
Stromberg Electric Co.

POWER

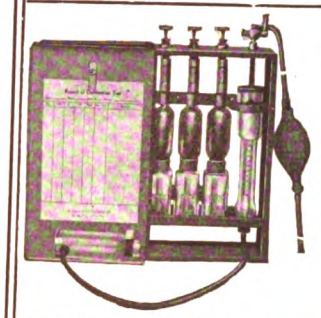
THESE motors will provide your machines with operating speeds to suit all kinds of jobs. They run at any speed over ranges up to 1 to 10. There is no power lost as speed is varied.

Get bulletin 1014 for details

Type A.S. Adjustable Speed RELIANCE MOTORS



Reliance Electric & Engineering Co.
1045 Ivanhoe Road Cleveland, O.
Branches: Boston, New York, Philadelphia
Pittsburgh, Cincinnati Detroit, Chicago



Hays Improved Gas Analyzer. Note absence of pinch clamps, rubber connections and glass cocks.

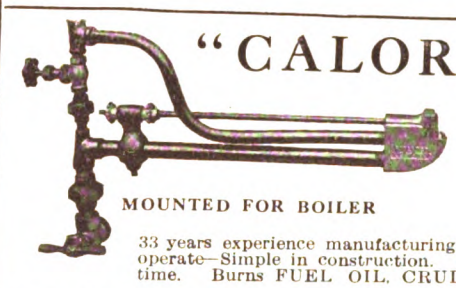
TWO INSTRUMENTS WITHOUT EQUAL as aids in cutting fuel costs are pictured here. Each is the very best of its kind on the market.

We have for free distribution to power plant men some intensely interesting and instructive pamphlets about flue gas analysis and draft regulation. It will pay you to write for them.



Hays Differential Draft Gage. Baked black enamel finish, steel case Rugged, accurate.

The Jos. W. Hays Corporation
Combustion Efficiency Appliances
Michigan City, Indiana



MOUNTED FOR BOILER

"CALOREX" Burners
Using STEAM or AIR for Atomizing

33 years experience manufacturing liquid fuel equipment. Cheapest to operate—Simple in construction. *No parts to wear out*—Will last a life time. Burns FUEL OIL, CRUDE OIL or TAR. Write for catalog

W. N. BEST FURNACE & BURNER COMPANY
11 Broadway ENGINEERS IN CALORIC NEW YORK



Increase furnace life with—

PLIBRICO JOINTLESS FURNACE LINING

Plibrico is a plastic furnace lining in unbaked form. It can be applied by anyone who can pound it into place with a mallet and trowel it smooth. When baked, it forms a one-piece, jointless furnace lining that withstands temperatures to 3100 degrees F. There are no bricks to loosen and fall out—no joints to crack. Consequently, Plibrico lasts two to four times as long as ordinary furnace linings.

Put an end to furnace troubles—do it the modern way—the economical way. Next time, reline with Plibrico—or old, broken fire brick linings, when patched with Plibrico, often give months more service.
Plibrico is sold only in steel containers of distinctive appearance as shown opposite.
Write for new fifty-page booklet, just off the press— "Modern Furnace Building."

Jointless Fire Brick Company
1154 Clay St. Chicago

See page 75

EQUIPMENT

Digitized by Google

Richards-Wilcox
Quality leaves its imprint



Again— Quality leaves its imprint

As a result of our contest for a new name for our ball-bearing I-beam trolley, 2,152 suggestions were received. The majority of contestants submitted names involving the use of the letters R-W, such as SupeR-Way, WondeR-Worker, etc., while four suggested that we use merely the letters themselves.

This convinced us that no better name than "R-W" could possibly be chosen, constituting as it does a universally recognized guarantee of quality and dependability. Therefore the following contestants, all of whom submitted the name "R-W," have each been awarded a $50.00 prize:

MR. CHARLES T. ALLEN
of National Metal Trades Association, New York City

MR. R. S. CHENEY
of Railway Purchases and Stores, Chicago

MR. FRANK HEIN
of Hein Implement Company, Ladysmith, Wis.

MR. C. E. DAVISON
of Harper and Reynolds, Los Angeles, Cal.

5 Exclusive Features

1 Because of its short wheelbase, the "R-W" operates almost as easily on curves as on a straight-away.

2 Felt washers prevent gritty dust and dirt from reaching the bearings. They also absorb oil from the oil hole and transmit it to the bearings continuously.

3 Bumpers protect all four wheels from chipping when trolleys bump together or strike the stop at the end of the track.

4 Combination radial and thrust bearings are found only in the "R-W." The ball races are ground and the balls themselves are of high-duty steel. This feature enables a one-ton load to be started by the pull of a man's little finger.

5 Reduced friction is assured by crowning the wheel treads. Also, the treads are chilled to obtain maximum hardness and thus minimize wear.

R925W

Ball-Bearing I-Beam Trolley

Every person who is familiar with R-W products knows that "R-W" and quality are synonymous. This is particularly true of overhead conveying equipment—a field in which "R-W" has long been accepted as a pledge of lasting satisfaction.

The "R-W" ball-bearing I-beam trolley (formerly the "Whale") is the outcome of a sincere desire to overcome *every* fault common to I-beam trolleys. Rigid tests over a long period of time have demonstrated that the "R-W" is the most durable, most efficient and most easily operated trolley ever produced.

Sent for Free Trial We are so confident of the ability of the "R-W" trolley to meet the most exacting requirements that we are willing to send it to any reputable manufacturer for free trial. Such a trial involves no obligation, for if the trolley fails to come up to your expectations it may be returned at our expense. The "R-W" trolley is made in seven capacities, ranging from ½ ton to 4 tons. Send today for the size best suited to your needs, or ask for Catalog DD-23.

Richards-Wilcox Mfg. Co.
A Hanger for any Door that Slides
AURORA, ILLINOIS, U.S.A.

Minneapolis · Philadelphia · Chicago · Boston · New York · St. Louis · Cleveland · Indianapolis · Los Angeles · San Francisco
RICHARDS-WILCOX CANADIAN CO. Ltd. — Winnipeg · LONDON, ONT · Montreal

Digitized by Google

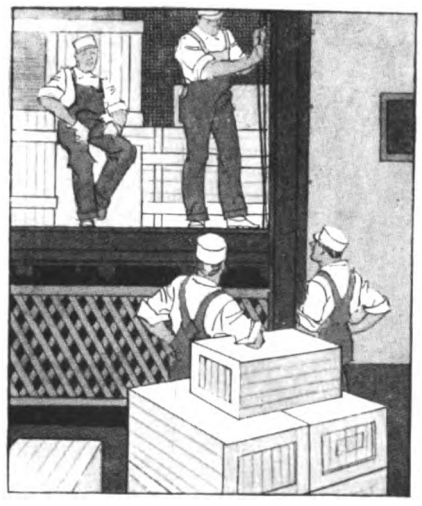
The Terrible Three Taxes

Wasted Space



Cluttering up factory aisles and working spaces with trucks, raw materials, and half-finished articles interrupts speedy, even-paced production. That is the tax to space.

Wasted Time



Taking too much time between operations cuts down production. It causes a large accumulation of half-finished materials because of the slowness of transforming raw material into finished product. That is the tax to time.

Wasted Effort



Toting or trucking materials and packages through a warehouse or factory costs money. That is a tax to gravity a tax that is paid by the energy and strength of your labor.

These are three taxes that cut into your profits. You can avoid paying them by handling and carrying materials in your plant automatically.

MECHANICAL conveyors take in raw materials, carry them from process to process, and ship out the finished product in the quickest and most economical way.

Conveyors bring materials and products quickly in an even, regular stream to the most convenient place for workers to pick them up. They save the steps, the time, and the strength of skilled employees by doing away with constant handling and rehandling.

A conveying system sets the pace for manufacturing processes. It insures your getting capacity production. It is the means of making the most money in the shortest time for labor and owner.

Let a Lamson Engineer help you

Perhaps you can avoid paying the terrible three taxes by Lamsonizing your warehouse or factory. To help you do this the Lamson organization's experience of many years in dealing with handling and carrying problems in practically every industry is at *your* service.

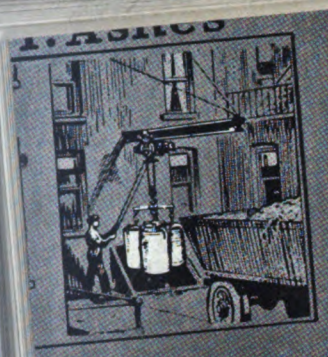
Send for one of our engineers. He will be able to tell you whether you need a conveying system in your plant. A unit or two in your shipping room may show you how profitable it would be to use conveyors throughout your entire plant. Each new unit begins to pay for itself at once. If you are convinced that Lamson Conveyors will be a profitable investment, we will not only see that they are put in but will help you get the most efficient service from them after installation.

LAMSON SERVICE

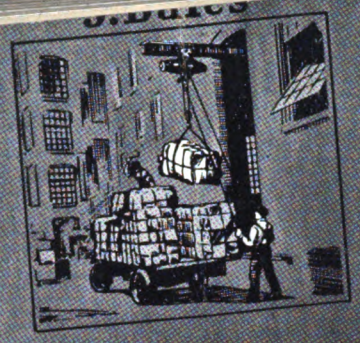
THE LAMSON COMPANY
SYRACUSE, NEW YORK
Branches in Principal Cities

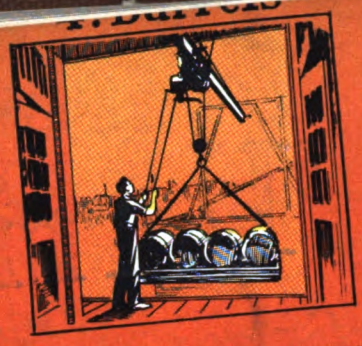
Lamson Conveying Systems

Digitized by Google

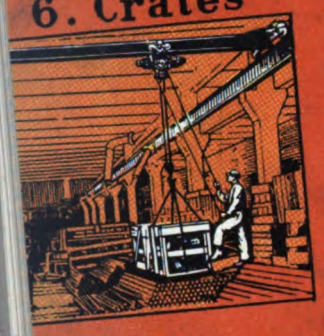


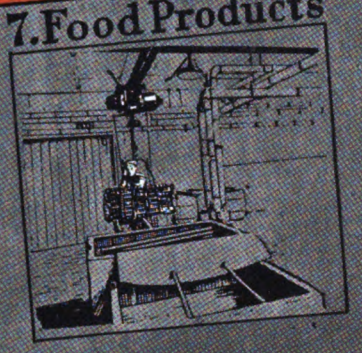


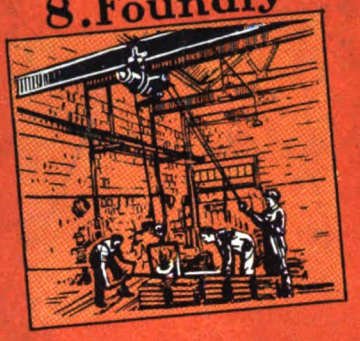


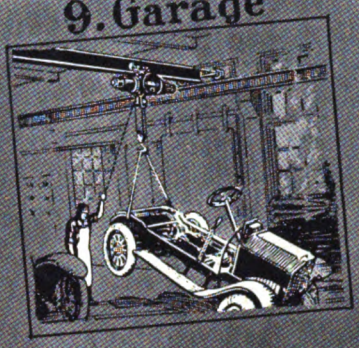


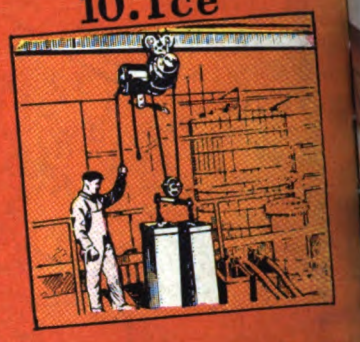


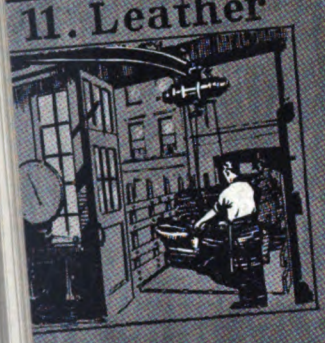




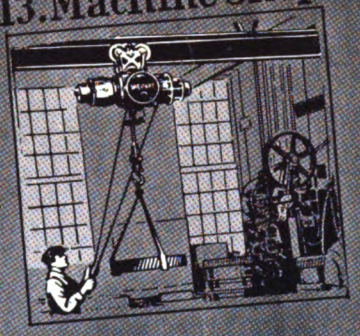




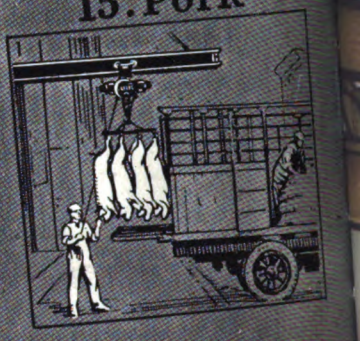


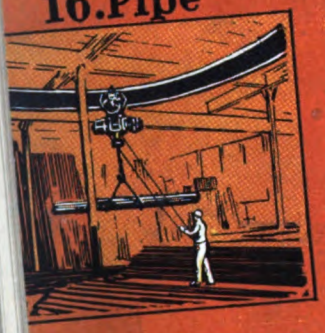


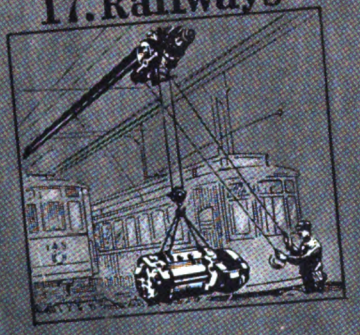


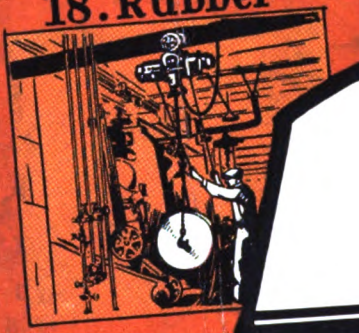


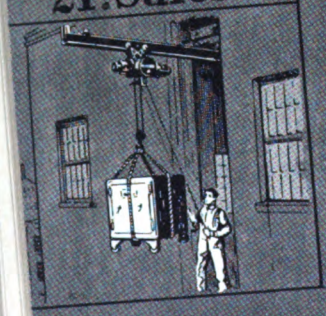




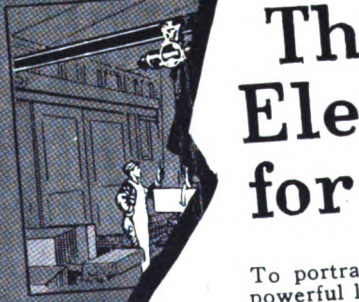


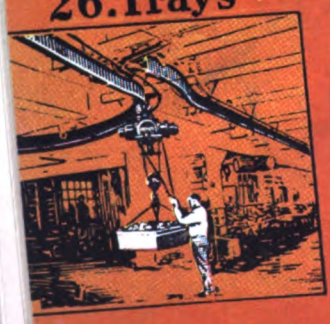


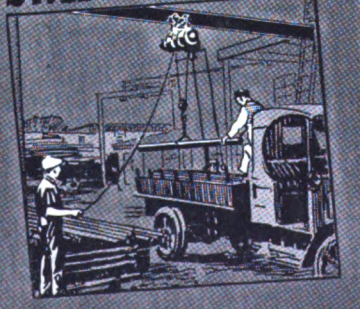




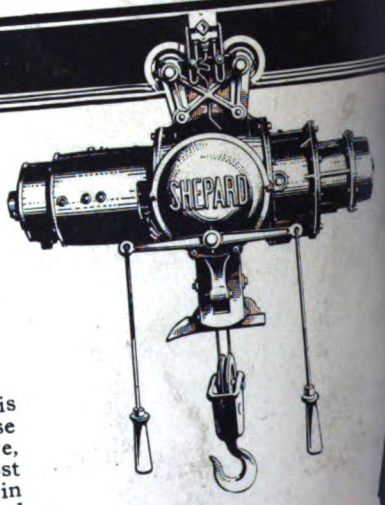








This *IS* an Electric Hoist for Everybody



To portray the almost unlimited use for this powerful little electric hoist, hundreds of these small pictures would be required. It is a sure, safe, ever-available, and remarkably low-cost method for moving and lifting loads—and in hundreds of widely varying industries and businesses IT HAS PROVED ITSELF.

YOUR MOVE

You'll make a move in the right direction—a move toward LOW COST load-moving and lifting (lower even than you may anticipate) when you send us the attached coupon for more information about "The Electric Hoist for Everybody." You incur no obligation in clipping the coupon.

SHEPARD
ELECTRIC CRANES & HOISTS

REG. U.S. PAT. OFF.

TODAY—MAIL THIS COUPON TO—

SHEPARD ELECTRIC CRANE & HOIST CO.
Montour Falls, N. Y.
420 Schuyler Ave.,

Send us your *LiftAbout* folder.

Name.....

.....City & State.....

I want to lift and move.....

Digitized by Google

APRIL 1923

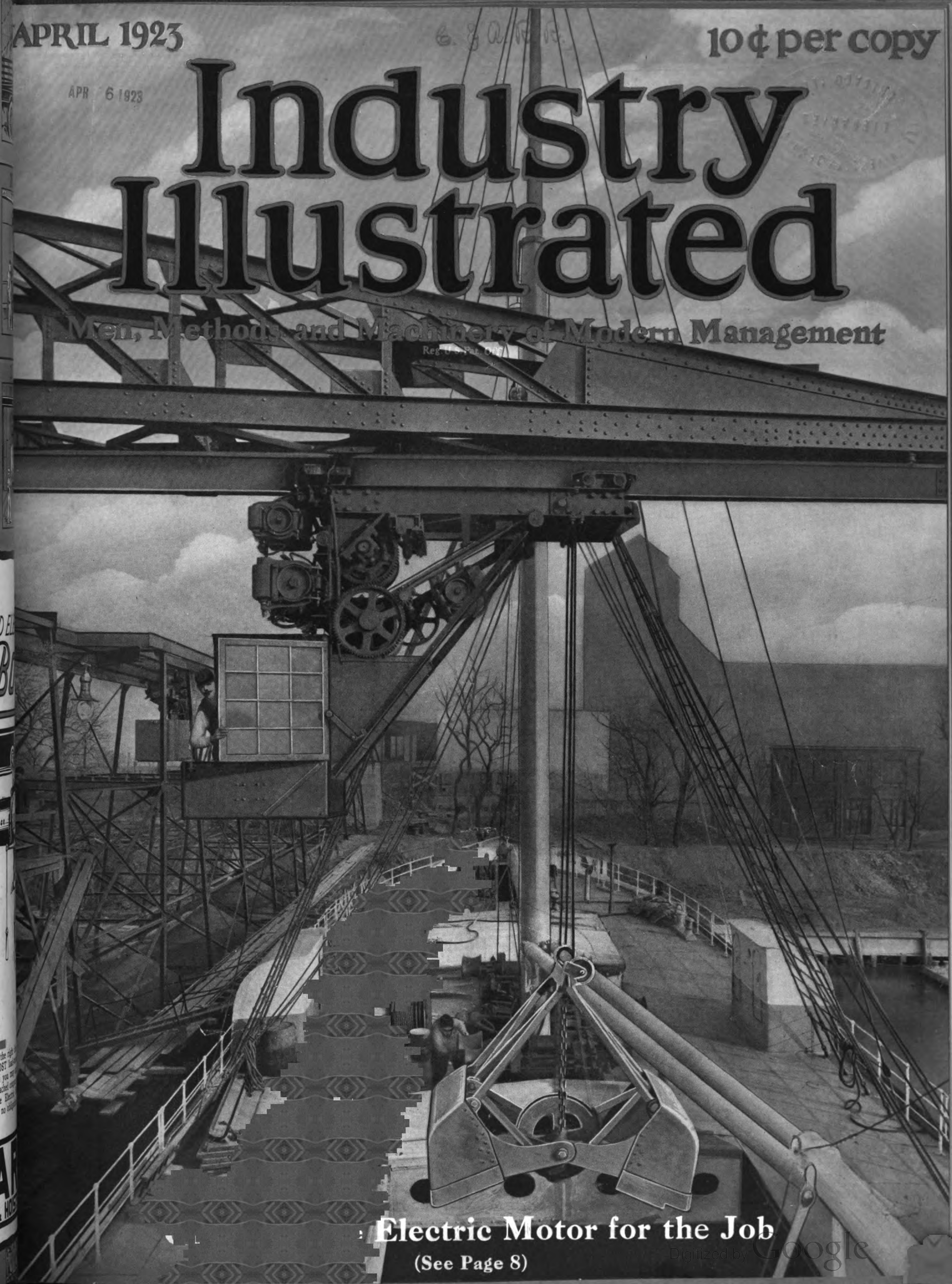
10¢ per copy

APR 6 1923

Industry Illustrated

Men, Methods and Machinery of Modern Management

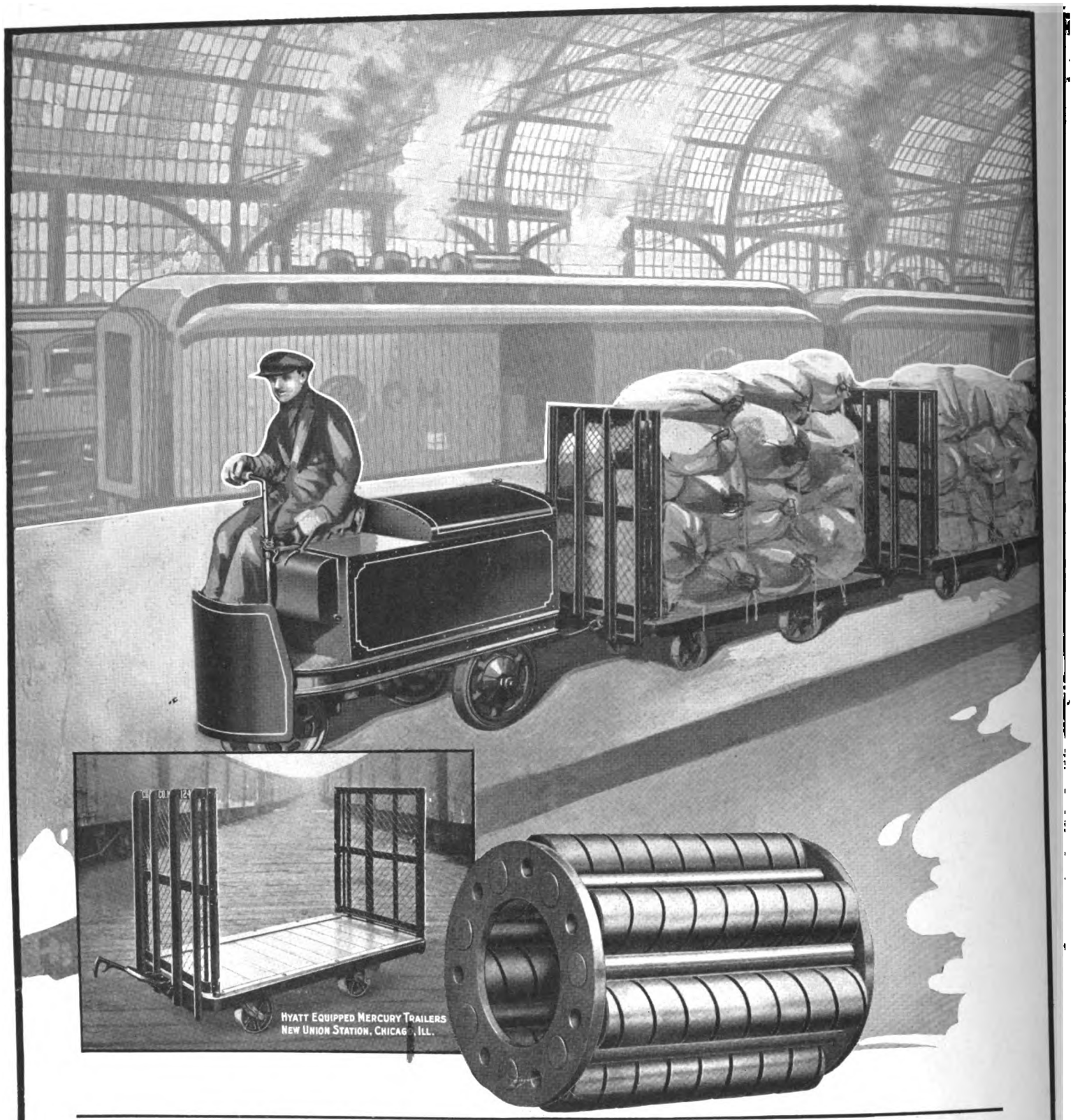
Reg. U.S. Pat. Off.



Electric Motor for the Job

(See Page 8)

Digitized by Google



MORE POUNDS PER TRAILER – MORE TRAILERS PER TRACTOR

Two hundred Hyatt equipped Mercury trailers are now being used to haul parcel post mail between the new Chicago Parcel Post Terminal and the new Union Station in Chicago.

The easy running Hyatt bearings make possible more pounds per trailer and more trailers per tractor, and they will give years of economical and successful service without adjustment or replacement.

Specify that your trailers be Hyatt bearing equipped and reduce your haulage costs.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago San Francisco
Worcester Milwaukee Huntington Minneapolis Philadelphia
Cleveland Pittsburgh Buffalo Indianapolis

Digitized by Google

INDUSTRY ILLUSTRATED

CONTENTS

April, 1923

Editorial—The Limitations of Work Page 7

Choosing the Electric Motor for the Job 8
By A. K. West

Handling Materials in a Book Bindery 12
By E. W. Palmer—The Economies Effected by Planned Layout and Mechanical Handling.

Is the Field of the Gasoline Tractor Limited? 14
By M. W. Potts—After Looking at These Examples of Gasoline Tractors in Operation, What is Your Opinion?

The Preparation and Burning of Pulverized Coal 18
By Homer L. Rank—Equipment and Process that Cuts the Coal Bill.

What Building Means to Business 21
By Ernest S. Bradford—The Close Economic Relation Between Construction Work and the Demand for Manufactured Products.

Automatic Lubrication 22
By Allen F. Brewer—Making Sure of Proper Oiling, by Doing it Mechanically.

Managing the Move 26
By W. H. Leffingwell—Getting Into the New Quarters with Least Confusion.

On page 56 will be found a list of those concerns to whose courtesy we are indebted for photographs in this issue not otherwise credited.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.

Founded 1891 by

JOHN R. DUNLAP

Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — HARVEY CONOVER, JR., *Vice President*

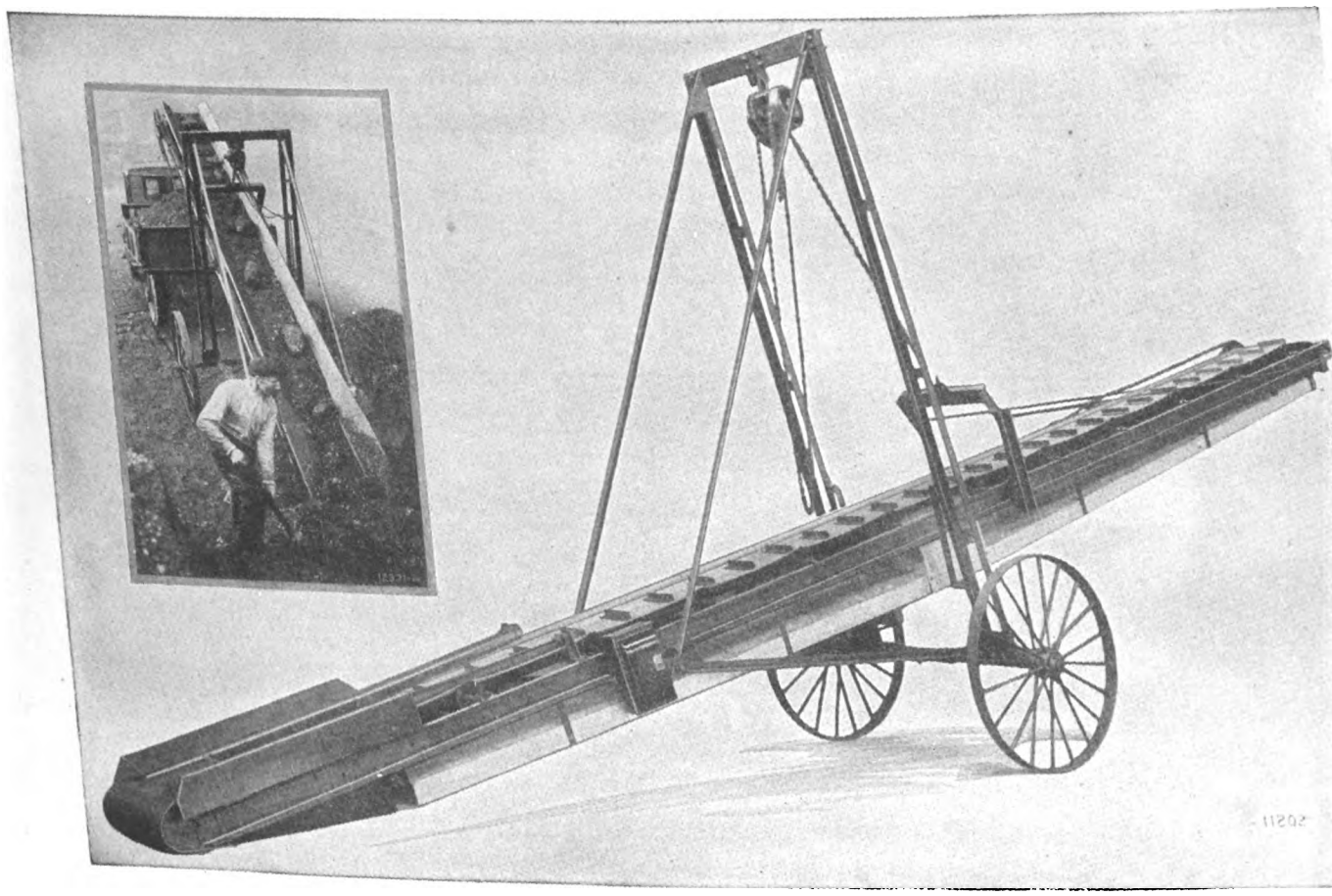
JOHN R. DUNLAP, JR., *Secretary-Treasurer*

Vol. 4, No. 4 Subscription price $1.00 per year; single copies 10 cents.

Copyright, 1923, by The Engineering Magazine Co., in both the United States and Great Britain.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google



THE "CUB"—A LINK-BELT LOADER—$585.00

FEATURES

Simplicity of design.
Length of conveyor, 21 ft.
Substantial construction—weighs about twice as much as some machines of this type.
18" wide belt, giving large carrying capacity.
Belt guaranteed against cutting or fraying.
Wide loading hopper at foot of conveyor is hinged—easily and quickly opened.
Requires little power—2 H.P. motor, 2 or 3 phase, 60 cycle, A. C.

HERE'S a seven-hundred-dollar Link-Belt Portable Belt Conveyor at our new low price—$585.00, F. O. B. Philadelphia. It is one of our standard types, built to the high Link-Belt standard. It is guaranteed.

Increased production, due to our large volume of sales, has made this low price possible.

Even if you load only a small quantity of material—at intervals—can you afford to pass up an opportunity like this? Fill out and return the coupon.

1187

LINK-BELT COMPANY, NICETOWN, PHILADELPHIA, PA. Date.....

☐ We are interested in the Link-Belt "Cub" Portable Belt Conveyor. Send us further information.

☐ We handle ..... tons of ..... per ..... from..... to .....

☐ Send us the Link-Belt Portable Loader Book No. 550, showing the complete Link-Belt line of Portable Loaders.

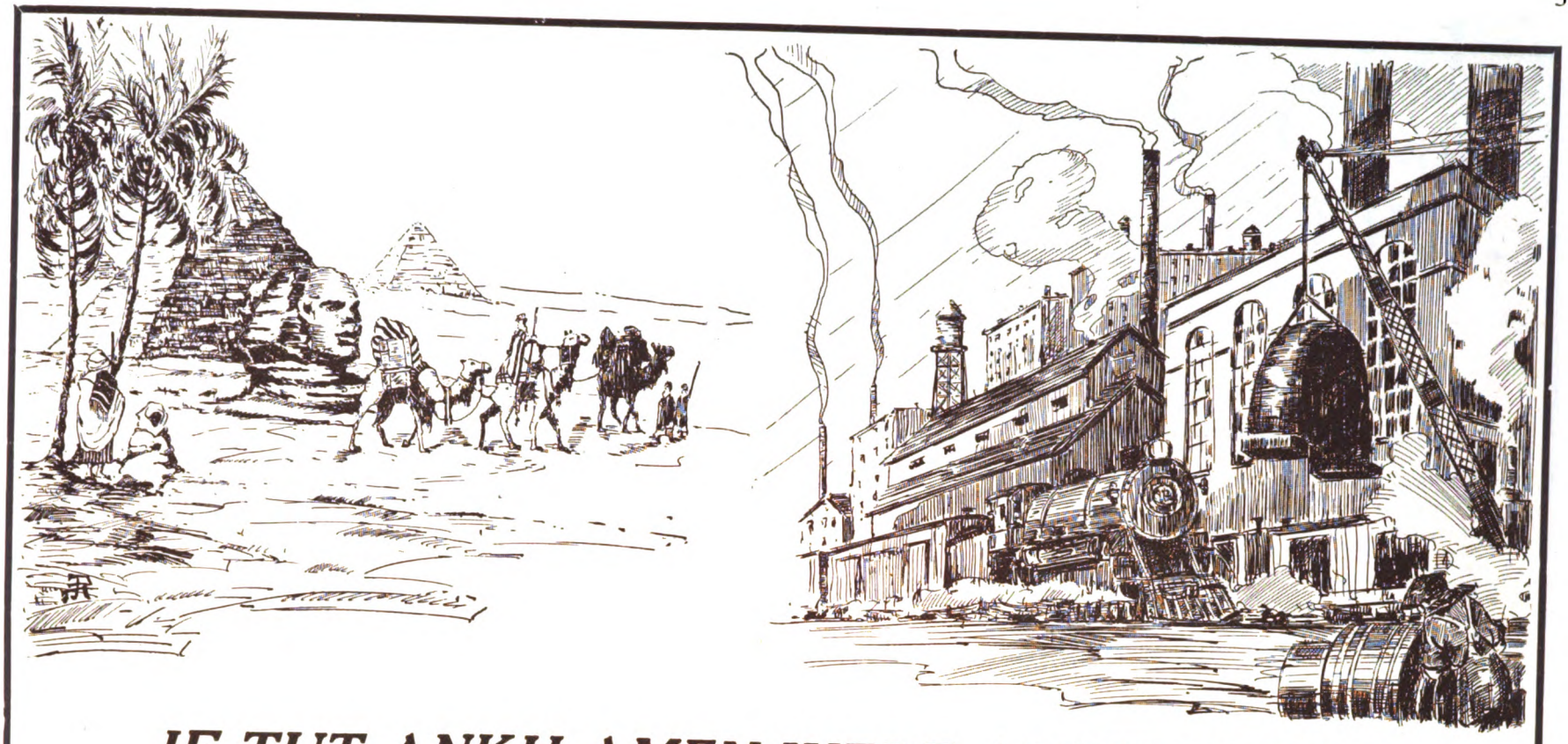
Name ..... Firm.....

Address ..... City..... State.....

Ind. Ill.

LINK-BELT

Digitized by Google



IF TUT-ANKH-AMEN WERE ALIVE TODAY

He would have 3400 years of personal experience, which he could capitalize. He would have, for example, a definite knowledge of industrial methods used in building the pyramids and Noah's Ark. He could tell of methods used by Tubal Cain in the iron industry and how they have been changed and developed up to the present time.

If ***you*** could live 3400 years and accumulate a knowledge of industrial management methods, by personal experience alone, you would become a very valuable man for any industrial organization.

The average man who is engaged in industrial work is depending very largely upon his personal experience to gain the necessary knowledge to fit him for executive work in industry. BUT he cannot make rapid progress in that way and he doesn't live long enough to cover any appreciable part of the field.

Industrial organizations everywhere are on the lookout for men who can manage production. They want such men ***now.*** They cannot wait until they have had 30 or 40 years of personal experience.

The Industrial Extension Institute can help you to shorten the way to a real executive job.

More than 100 prominent industrial engineers and industrial executives have prepared the Factory Management Course and Service. This is an organized course of training in industrial engineering and management.

Each one of these men has had a minimum of 25 years practical experience in the field of industry. So in the aggregate you get the benifit of more than 2500 years of production experience by enrolling for the Factory Management Course and Service.

This is the only sound way to broaden your knowledge of successful practice in the industrial field. Don't depend solely upon personal experience.

Start the correct way now, Send for this booklet.

Industrial Extension Institute

11-17 East 45th St. New York N. Y.

The Only Complete Course in Industrial Management.

INDUSTRIAL EXTENSION INSTITUTE
11-17 East 45th Street, New York City

Gentlemen:—

Send me without obligation your 100 Page Book "Thinking Beyond Your Job."

Name.....

Home Address.....

Position.....

Company.....

Co. Address.....

Ind. Ill. April 1923

Digitized by Google

THE MOST ECONOMICAL AIR COMPRESSOR AND VACUUM PUMP

NASH HYTOR

THE HYTOR COMPRESSOR is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

The rotor, the only moving part, is cast in one piece, the blades being rigidly reinforced by shrouds. The rotor is mounted on a short, stiff shaft supported at each end by the highest grade annular ball bearings mounted outside of the casing.

As the peripheral clearance is large, there is no possibility of the ends of the rotor blades coming in contact with the casing.

The original high efficiency is maintained indefinitely in continuous service.

The air is thoroughly washed during compression and contains no oil.

Hytor compressors occupy very much less floor space and are much lighter in weight than reciprocating compressors. They run without vibration.

The cost of installation is greatly reduced as no expensive foundations are necessary.

No expert attendance is required as there are no adjustments to make. The cost of upkeep is negligible.

Hytor compressors are quiet in operation.

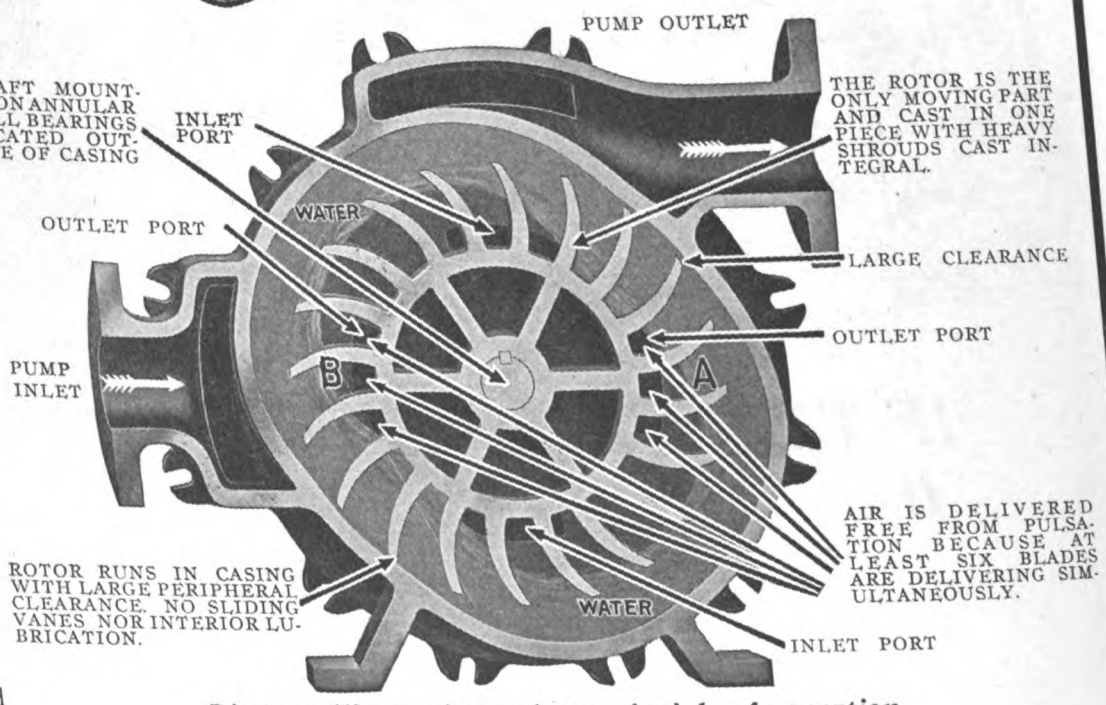
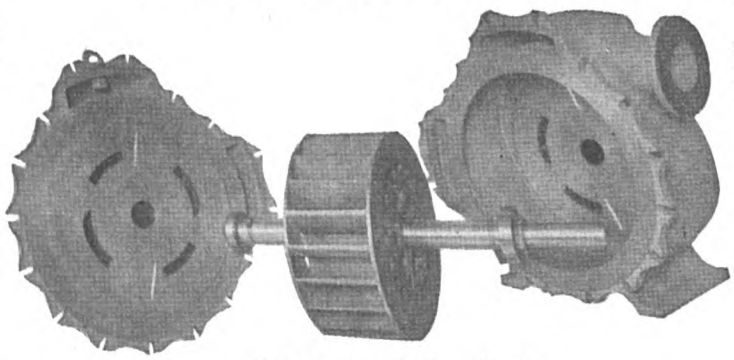
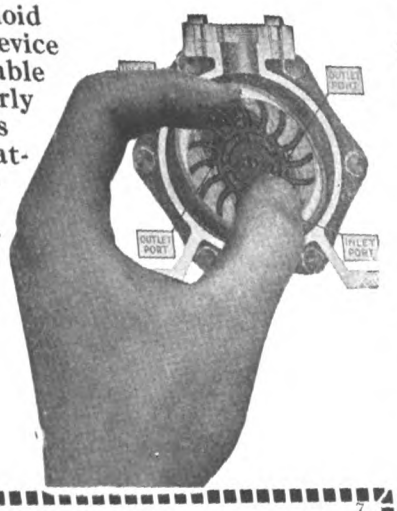


Diagram illustrating unique principle of operation



A ROTOR in hydraulic balance revolves freely in an elliptical casing filled with water. The water, turning, with the rotor, and constrained to follow the casing by centrifugal force, alternately recedes from and is forced back into the rotor, twice in a revolution. As the water recedes from the rotor it draws in the air through the inlet ports. When the water is forced back into the rotor by the converging casing, the air is first compressed and then discharged through the outlet ports.

This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

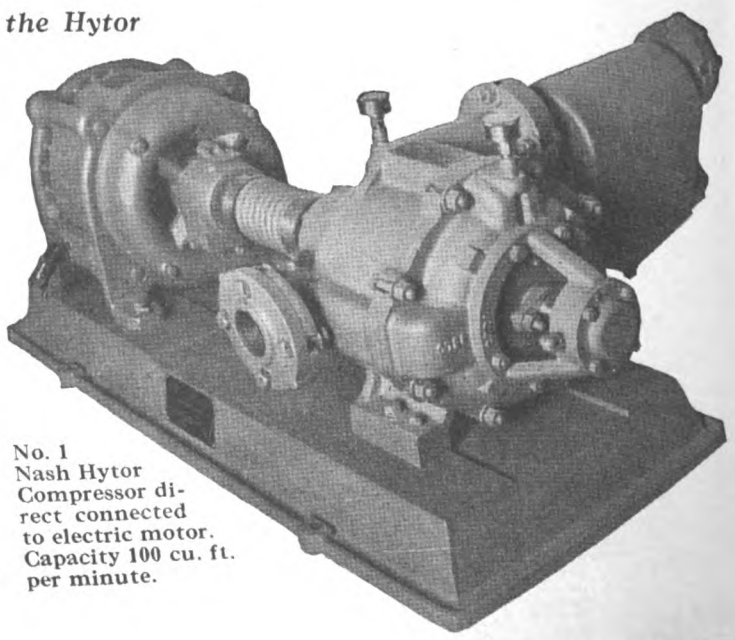


All parts of the Hytor

At pressures up to and including 15 lbs. per square inch, and vacuums up to 20 inches of mercury, the Nash Hytor affords the simplest and most economical means for handling air or gas, for all of the usual purposes where air under pressure is required, and they can be used on many special services for which the ordinary compressor is not adapted.

It is common practice in handling mildly acid vapors to re-circulate thru the pump an alkaline solution for the protection of the cast iron structure of the pump. In handling chlorine gas, concentrated sulphuric acid is re-circulated.

Air handled by the Hytor is delivered absolutely clean and free from dust and oil; a great advantage in the agitation of good products or in absorption processes where diffusion of air is accomplished by blowing thru filters, porous blankets or small orifices.



No. 1 Nash Hytor Compressor direct connected to electric motor. Capacity 100 cu. ft. per minute.

7

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps
- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps

NAME.....
POSITION.....
COMPANY.....
ADDRESS.....

NASH ENGINEERING CO.
SO. NORWALK, CONN. U.S.A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Adolf Schildkraut, Art Director Reginald Gordon, Associate

EDITORIAL

The Limitations Of Work

THERE is a limit to everything that is finite. In most instances, that limit is close by; in others, it is farther away; but, in all instances, it can be defined. There are limits to speed, pressure, resistance, strength of materials and the like.

It is engineering practice to ascertain whether a limit is close by or far away; to find out how close it is or how far away, for all kinds of engineering projects. Before beginning construction work, the engineer must know what the limits are to the strength of the materials that are to be used. He cannot afford to assume anything in this regard and makes elaborate tests to determine how much strain the materials he expects to use can withstand safely. He encounters other limitations such as those of time in which to do the work, available funds, and ability to secure competent workmen. His work is limited in all respects.

An engineer does not attempt to utilize every last vestige of strength that a material of construction may possess. He tries to ascertain what strength that material has so as to know how to play safe. After he finds out what the amount of strength is, he utilizes only a reasonable proportion of this strength and depends upon the overplus to take care of miscalculations, emergencies and overloads. This overplus represents the factor of safety and it is always made large in construction work. If an engineer should be foolish enough to utilize all the strength he believed the materials to have, his structure would collapse at the slightest change in existing conditions.

Not only is the kind of work a man can do limited because of the limitations to his ability, but the amount of work he can do is limited because of the limitations of his human endurance. These limits are variables, they are elastic limits, but there is only a certain amount of work capacity in any man and there is only a certain amount of work in a workman. When all the work there is in a workman has been gotten out of him, that workman is dead.

There is a limit to the amount of work a workman can do safely; that is, with safety to industry. The evolution of a good workman is a slow, expensive process. Industry cannot afford to attempt to utilize too great a proportion of the strength or endurance of its workmen. They must be afforded at least as much margin of safety as is given the materials of construction, or the danger of their collapse becomes apparent.

Digitized by Google

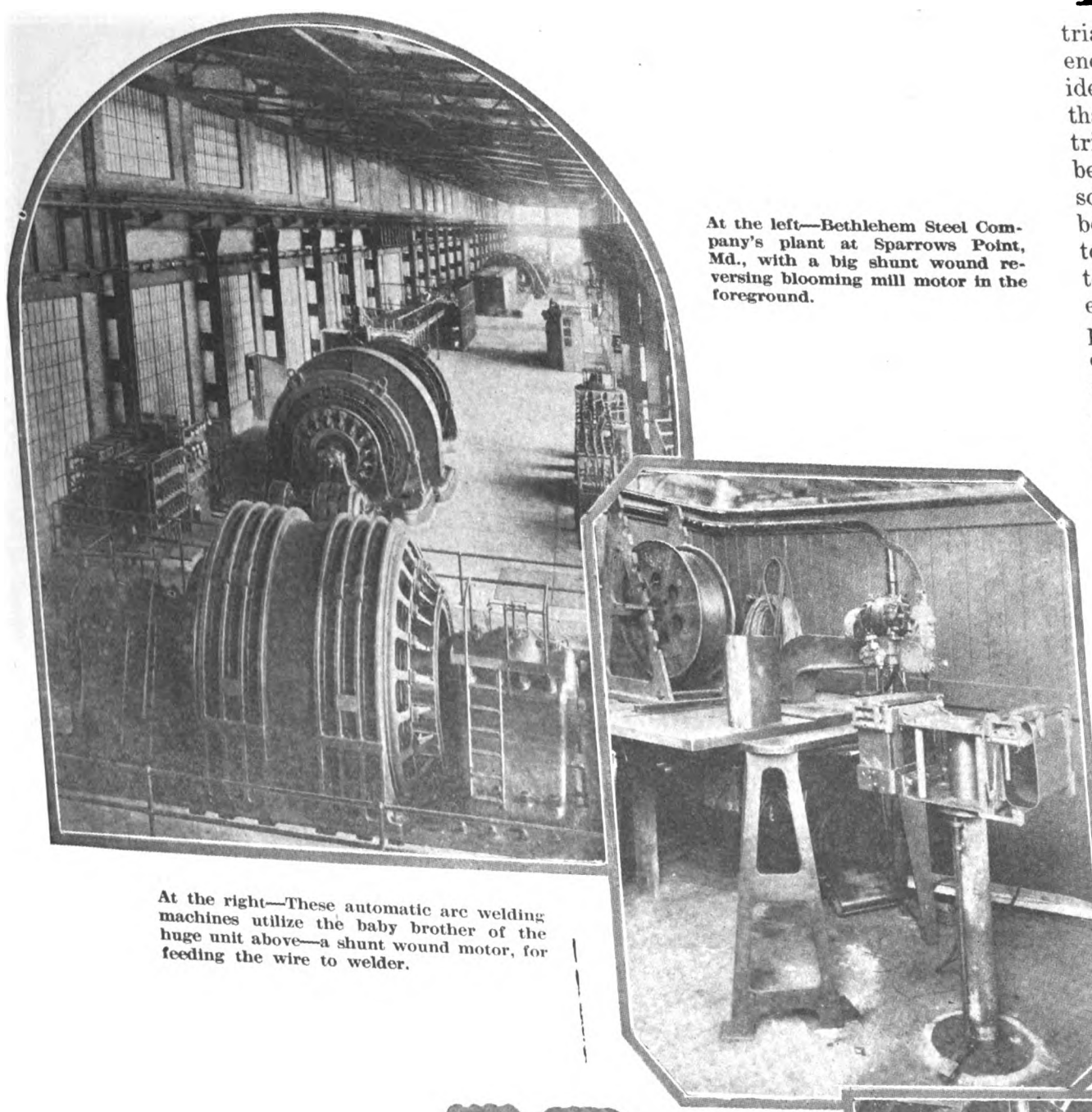
Choosing the Electric Motor for the Job

By A. K. West

THE part played by the electric motor in developing our present indus-trial era has undoubtedly been enormous. In fact, the electric idea is so firmly established that the question, "Shall electric motors be used?" has been superseded by, "What sort of motor will do the work best?" It is no exaggeration to say that the proper answer to this question has a decided effect upon the operating expenses and general efficiency of industrial plants. Electric motors have pronounced characteristics that fit or unfit them for certain classes of work; and even a superficial knowledge of these is of much value in applying the motor to the job in hand.

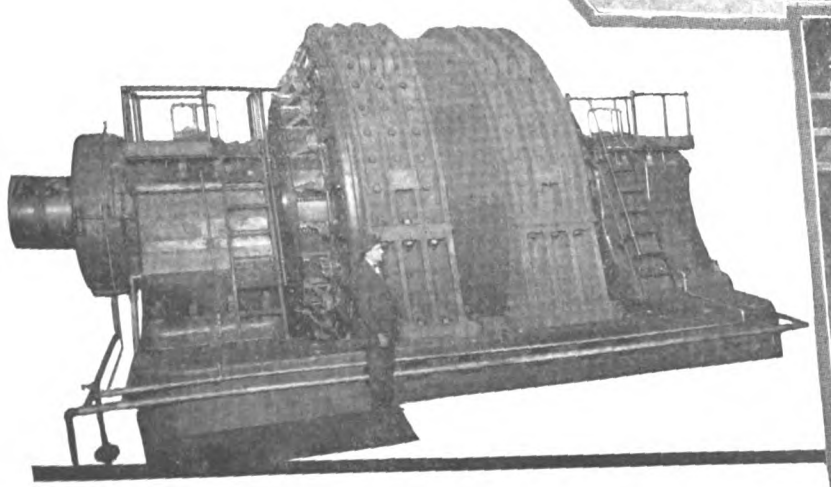
Electric motors are divided into two general classes, direct current and alternating current. They are further subdivided, the direct current into shunt, compound, and series motors; the alternating current into induction, synchronous and series, or commutating. These terms refer to the method of connecting the motor, or to some particular characteristic of its operation.

The characteristics of the shunt motor give it, industrially, the greatest field of any of the three direct current motors. Its field, upon the strength of which its speed and

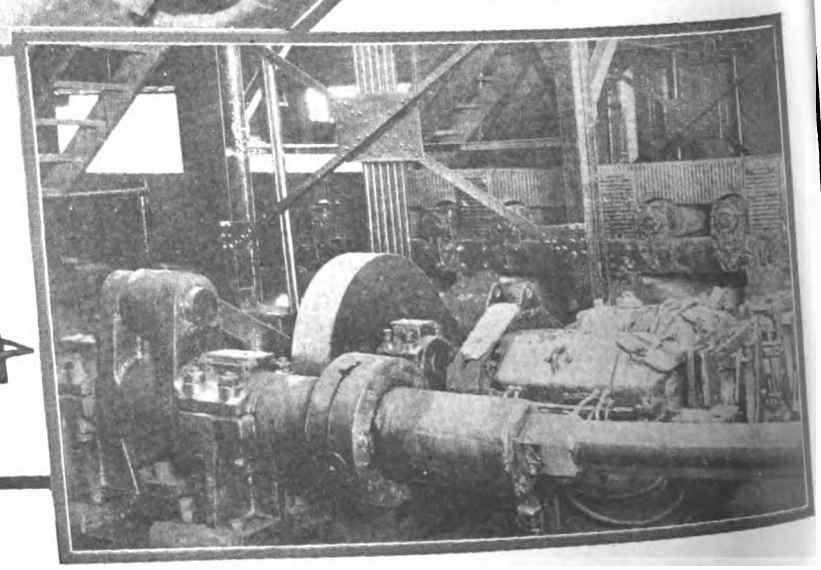


At the left—Bethlehem Steel Company's plant at Sparrows Point, Md., with a big shunt wound reversing blooming mill motor in the foreground.

At the right—These automatic arc welding machines utilize the baby brother of the huge unit above—a shunt wound motor, for feeding the wire to welder.



This unit is similar to the one shown at the top of this page. It is a 7000 hp. reversing motor for blooming mill drive.



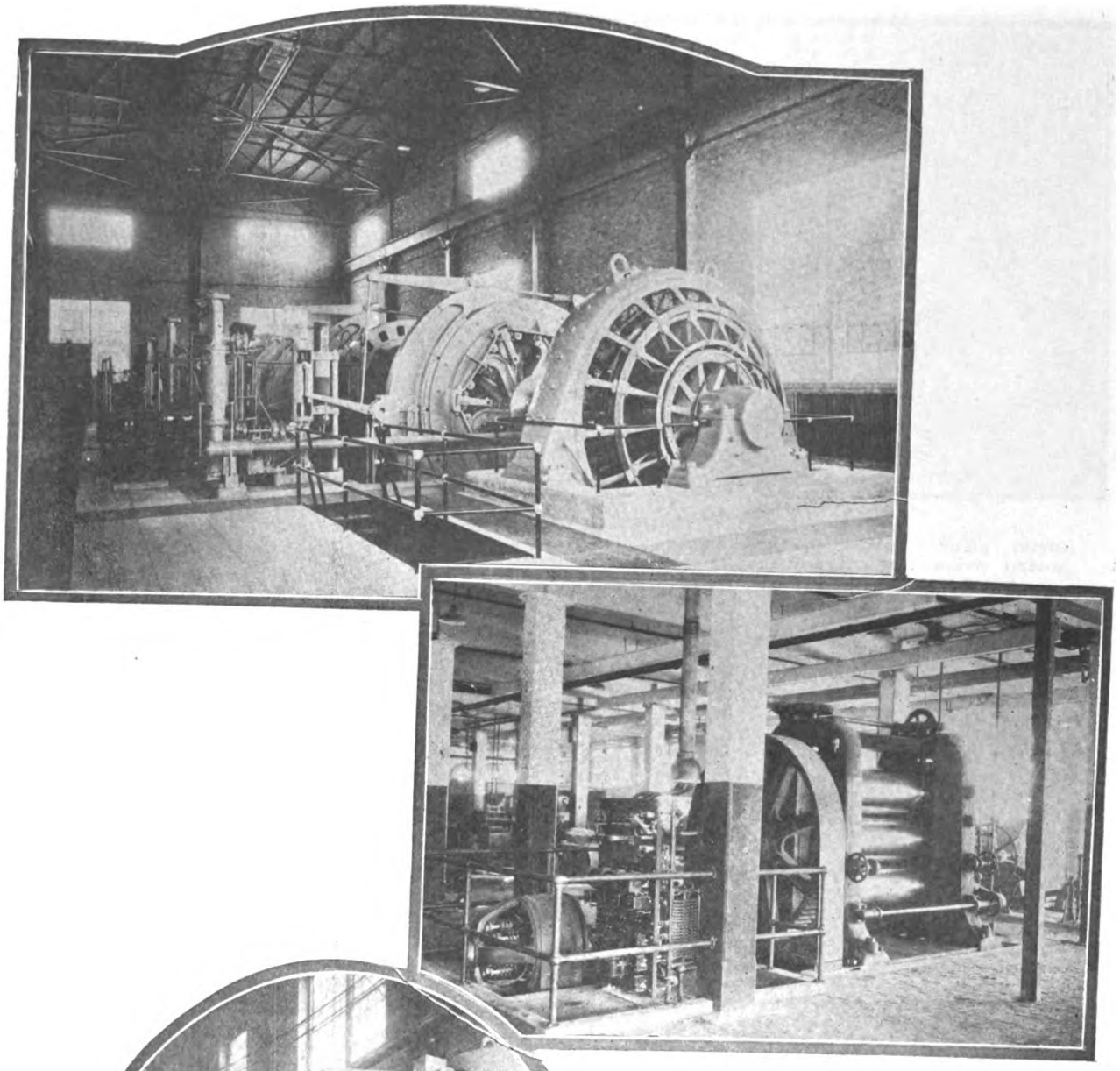
The "Manipulator kick-up fingers" on this blooming mill of the Trumbull Steel Co. are operated by two series-wound motors.

Digitized by Google

The speed of the series-wound motor, varying with the load makes it particularly useful for hoists.

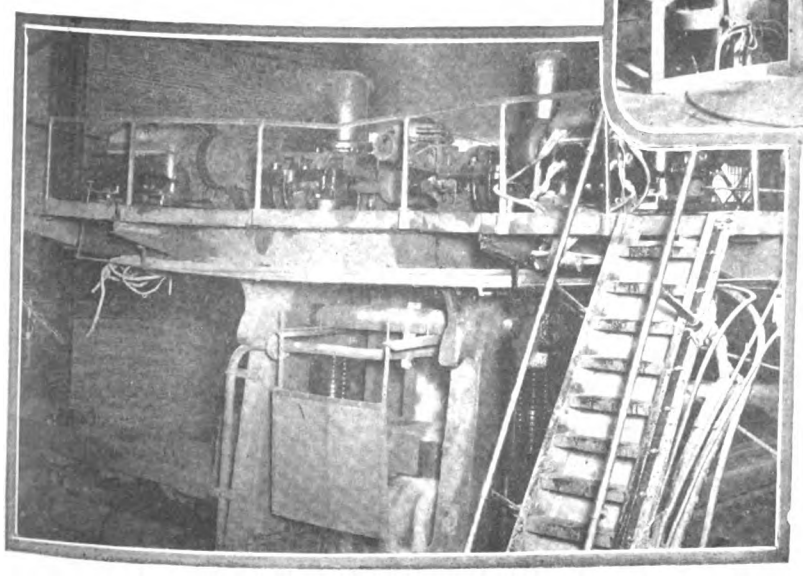
torque depend, is "shunted" or connected across its armature and the power supply. The speed is practically constant for all reasonable variations in load, its torque is not affected by its speed and is therefore good during starting and accelerating periods, and its efficiency is high over a wide range of load. Its speed is readily controlled, variations being made by changing the amount of resistance in the field, the speed of the motor being inversely proportional to the strength of the field, within certain limits. The shunt motor is applicable to a wide variety of uses; for example, driving line shafts, blowers, reciprocating pumps and machine tools. Most of these applications call for constant speed over long periods of time, and good efficiency under varying load conditions. A notable example of shunt motor application, notable both from the size of the motors and the severity of the working conditions under which they operate, is that of driving reversible rolling mills in steel plants.

The largest motors used in this work are rated at 8000 HP continuous with a momentary capacity of 17000 HP. An idea of their size can be gathered from the fact that the

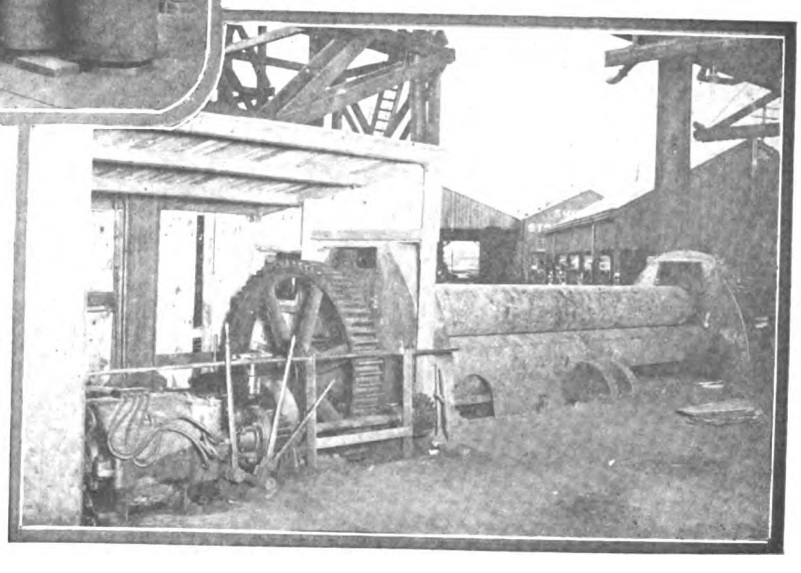


Calendar rolls at the New England Tire & Rubber Co., driven by 100 hp. D. C. motor with semi-automatic control.

At the left—Bethlehem Steel Company's vertical rolls, driven by a compound-wound motor.

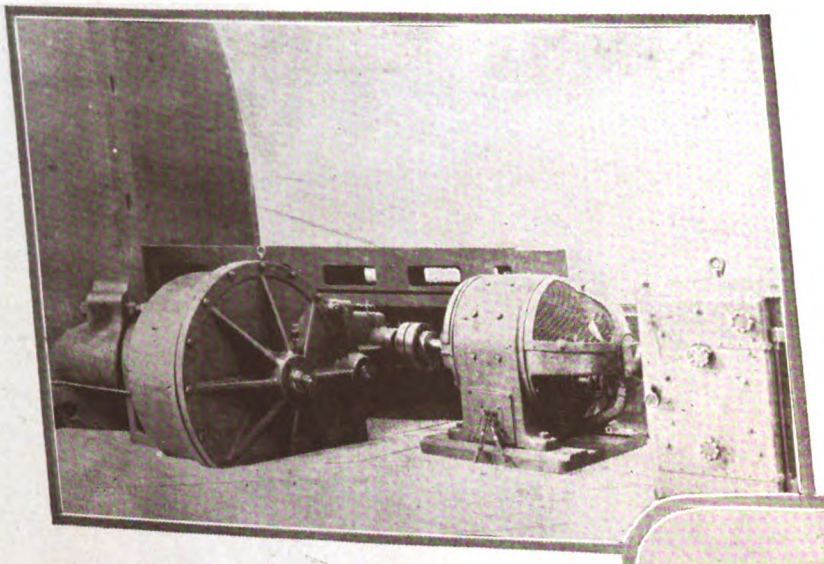


Here is the "screw down" on a blooming mill, operated by two compound-wound motors.

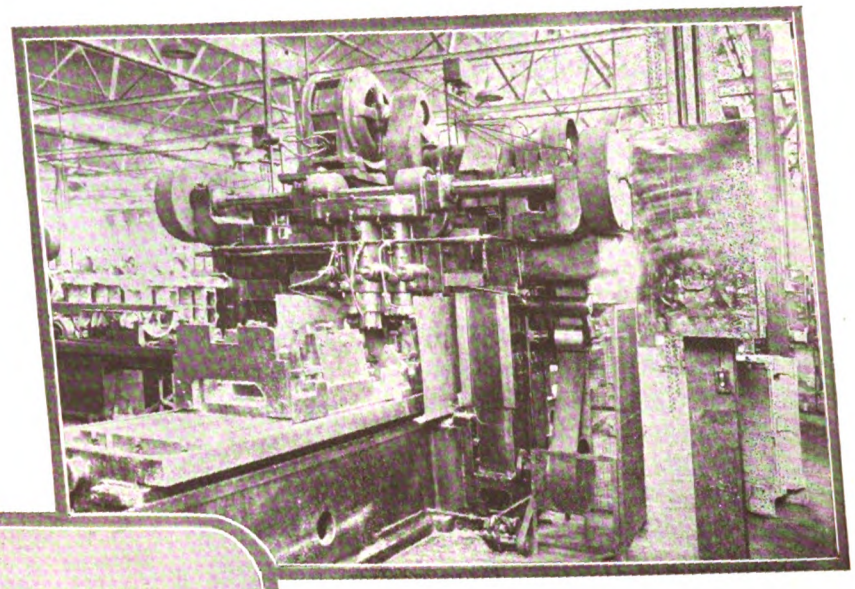


Bending rolls equipped with compound-wound motor—Harlan & Hollingsworth Corp.

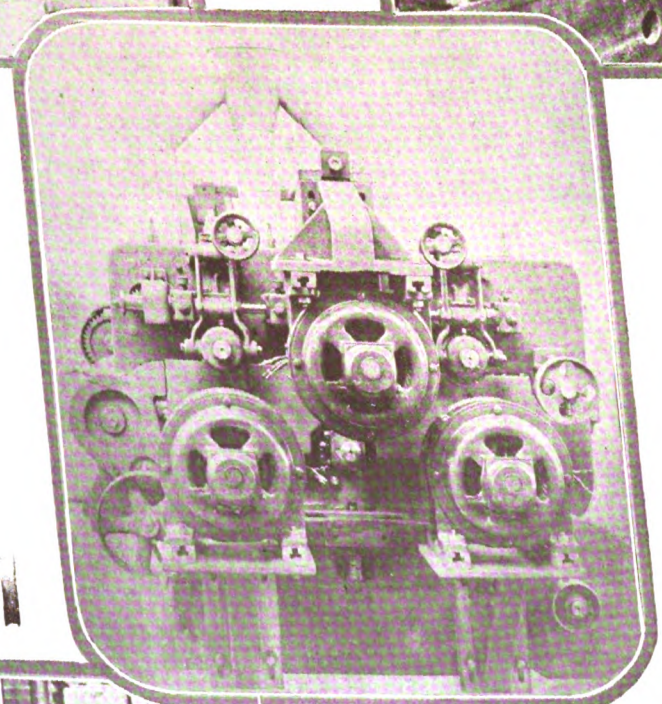
Digitized by Google



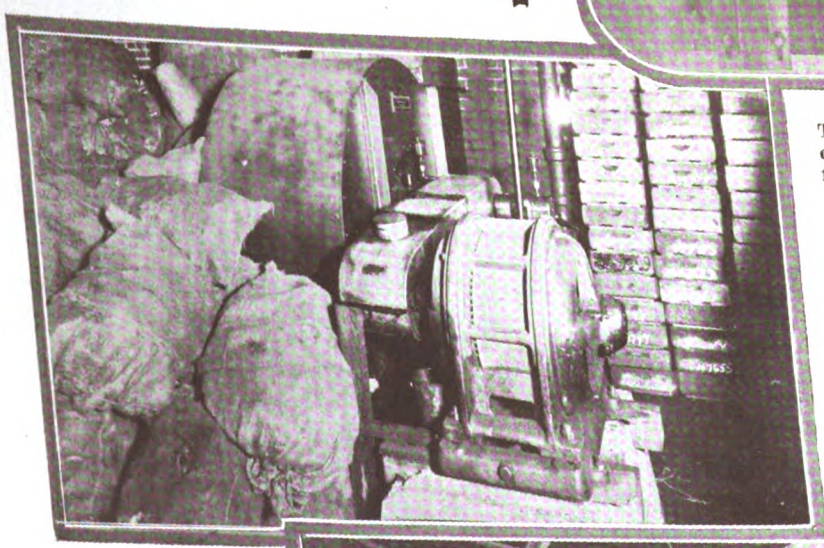
Metal planer, driven by compound-wound motor through reduction gear.



The squirrel cage (A. C.) motor as used to drive one of a battery of milling machines.



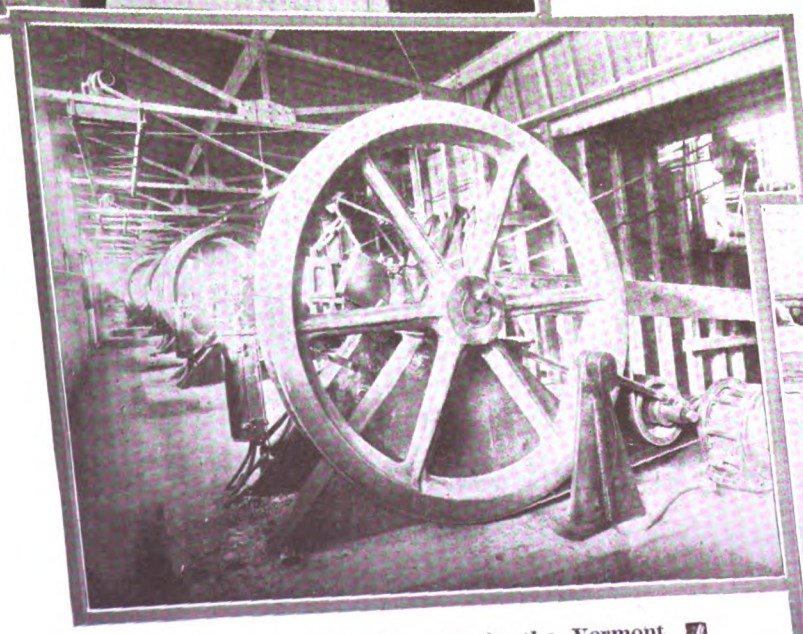
The best-known service of the induction motor, perhaps, lies in the field of the blower or fan.



Three squirrel cage motors driving the drums of a sanding machine through flexible couplings.

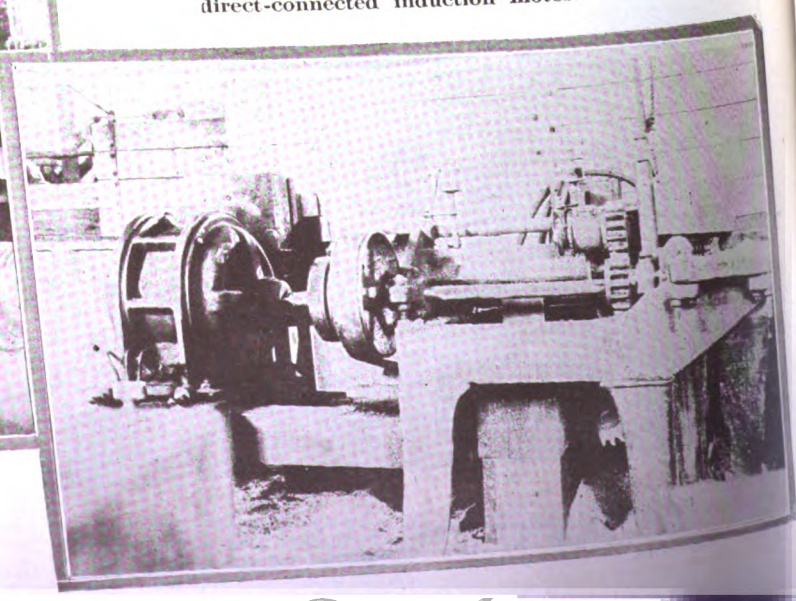
armature alone of one of them weighed 82 tons. Their work is of the most exacting nature, the local characteristics of a rolling mill consisting of a series of high peaks, alternating with periods of practically no load, and frequent reversals. An application of the opposite extreme is automatic arc welding. Here a ¼HP shunt motor is used to drive a set of feed and straightening rolls that feed the electrode wire to the arc. Here, also, the importance of constant speed comes in, as the wire must be fed at as nearly a uniform rate as possible. A great number of other applications could be cited, but probably without giving any better idea of the characteristics of the motor.

The field of application of the series motor is limited by its peculiar speed characteristics, although for certain applications it is invaluable. In

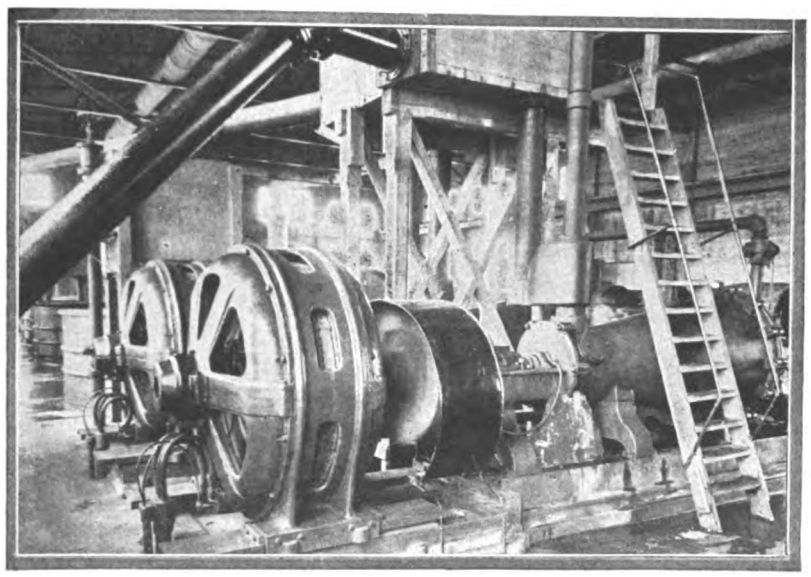


Stone cutting gang saws in the Vermont Marble Co., driven by individual 10 hp. induction motors.

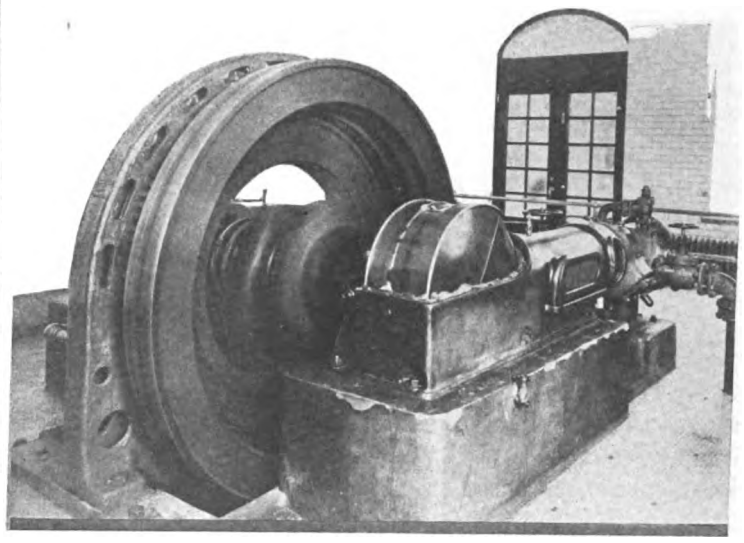
Below is a five-saw lath machine of the Weyerhauser Timber Co., driven by a direct-connected induction motor.



Digitized by Google



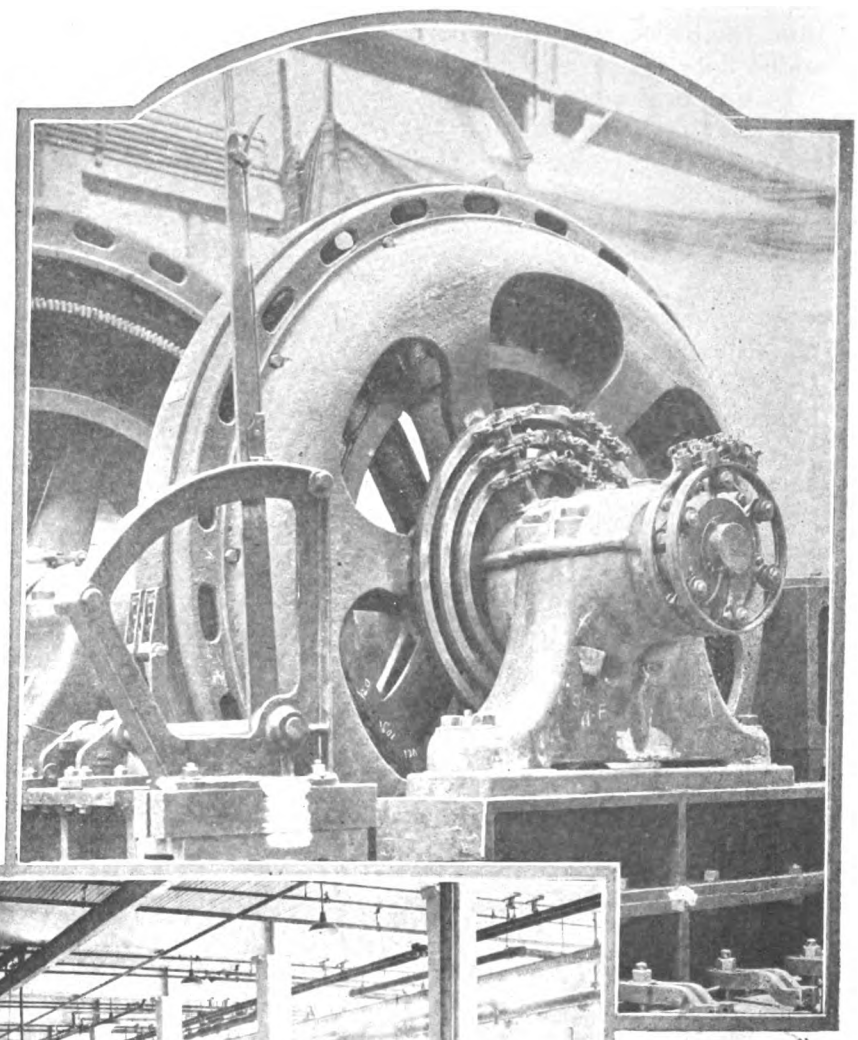
Two 200 hp. synchronous motors at the Hoskin-Morainville Paper Company's plant at Menominee, Mich.



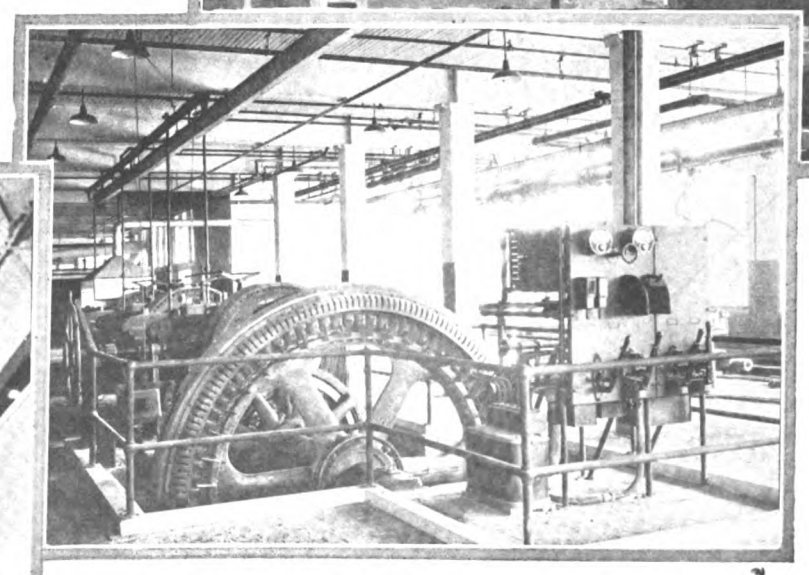
Ammonia compressor at the Colonial Ice Cream Co., Philadelphia, driven by 300 hp. synchronous motor.

this motor, the field is connected in series with the armature and the line so that its speed varies with changes in load, being directly proportional to the amount of the load. The efficiency is high throughout a wide range of speed, and the torque at low speed, or under heavy overload, is high. A limitation in the usefulness of these motors is that at no load the speed becomes so high as to be dangerous. Therefore they are always connected rigidly to the load, being very seldom used for belt drive, for instance, where they are liable to be unloaded through the breaking or slipping of the belt. Their particular field of application is for cases where high starting torque is required, and the matter of changing speed is negligible. Consequently they are largely used on electric railways, for hoists, cranes, and other machinery that must

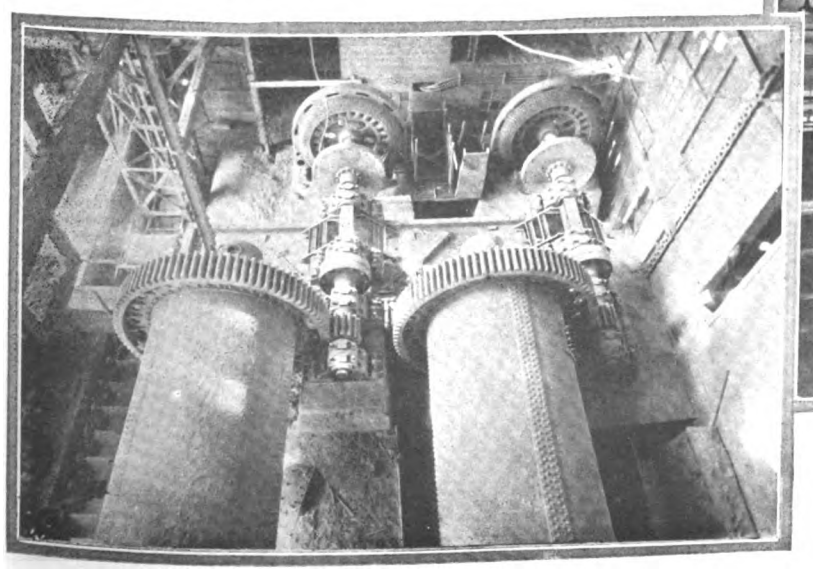
(*Continued on page 59*)



At the right—a 450 hp. synchronous motor with revolving stator.



Looking down on two 500 hp. synchronous motors driving tube mills at the Western States Portland Cement Company's plant.



Above—A 250 hp. synchronous motor which drives three 60″ mills at the New England Tire & Rubber Company, Holyoke, Mass.

Digitized by Google

Handling Materials in a Book Bindery

The Economies Effected by Planned Layout and Mechanical Handling

By E. W. Palmer

A GLANCE into any bindery would convince the most versatile industrial engineer that the paramount problem in bookbinding, from an efficiency standpoint, lies in eliminating rehandling of materials and work in process. To accomplish this usually means the rearrangement of machine groups, installation of added transportation facilities, and acquiring added floor space.

In our own plant the problem was quite the same but we reversed the processes. First we leased new quarters, where we could obtain 65,000 square feet of space on a floor, thus enabling us to handle the binding of a book from the receiving of the flat printed sheets from the press room to the delivery of the completed volume, all on one manufacturing floor. When one considers that the average novel or school book in its progress through the bindery, in the successive stages of folding the flat printed sheets into "signatures" (or sections of 16, 32, or 64 pages), pasting in the illustrations (inserts), gathering the sections together, sewing, smashing, trimming, gilding edges, rounding and shaping the back, reinforcing the book to hold it in the cover and finally placing the book in the cover, pressing and drying before examination, wrapping and shipping; not to mention the cutting of material for and making and stamping the covers themselves; no less than 63 separate operations are involved, this one floor plan includes a very careful floor layout.



A view of the Sheet Room, with the Machine Sewing Division in the foreground. Note the individual machines, each a moveable unit, the cord and plug connectors; the worked material handled to and from the machines on platforms by means of lift trucks.

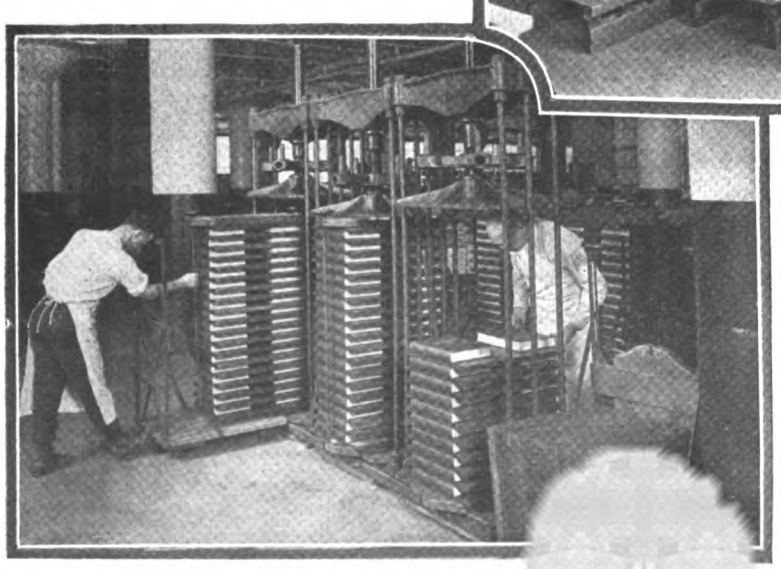
Another view of the Sheet Room, Pasting and Gathering Division, showing the manner in which work ahead for machines may be placed ready for use where machine is finishing previous lot. Note again individual cord and plug connections to each machine and maple top tables with standard iron pipe legs.



With a very scientific layout, whereby work progresses through the various stages of manufacture without retracing a step, much is accomplished. This requires "assembling" points at or near the machine and hand working groups and machines grouped to facilitate bulk production.

In order to make our plant "flexible" we ran all wiring in conduits on the ceiling, with plug receptacles placed systematically, so many to each bay. All machines of a moveable type are mounted on polished maple bases with individual motor, control apparatus and pilot light. Power is obtained through standard cord connectors having plugs at both ends. This permits moving machines at will, regrouping, replacing, etc., and does not deface building nor present power difficulties.

All machines are equipped with individual motors, thus eliminating all lost time possibilities so prevalent where single unit, shaft and belt

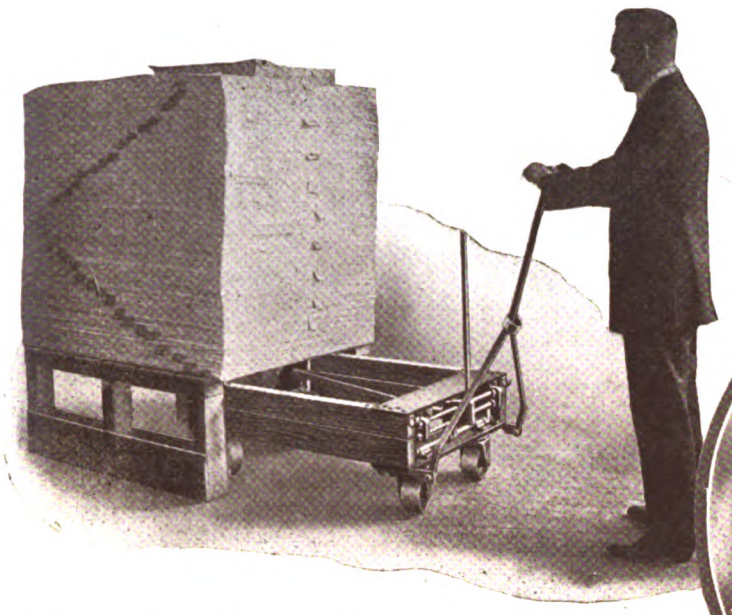


Building books, by means of Removal into press, and method of removing

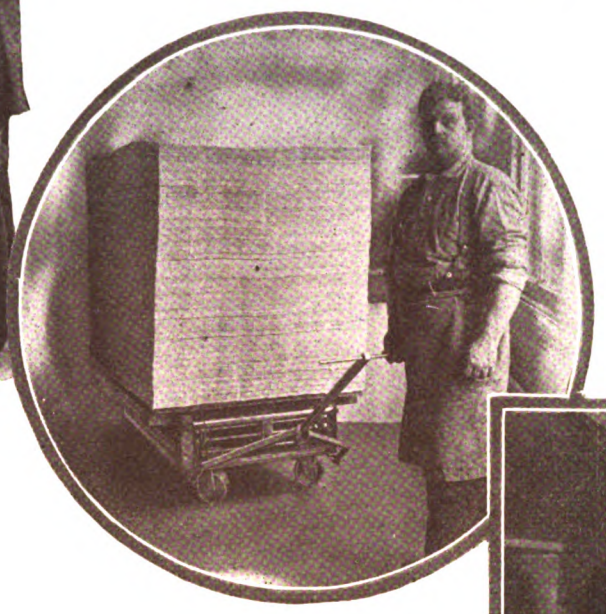


Removing finished and dried books from moveable press direct to examiner's table.

Digitized by Google



This plant is more than ordinarily aware of the advantages of the lift truck, for the reason that the germ of the whole platform lift-truck idea had its inception in the mind of its former plant engineer.



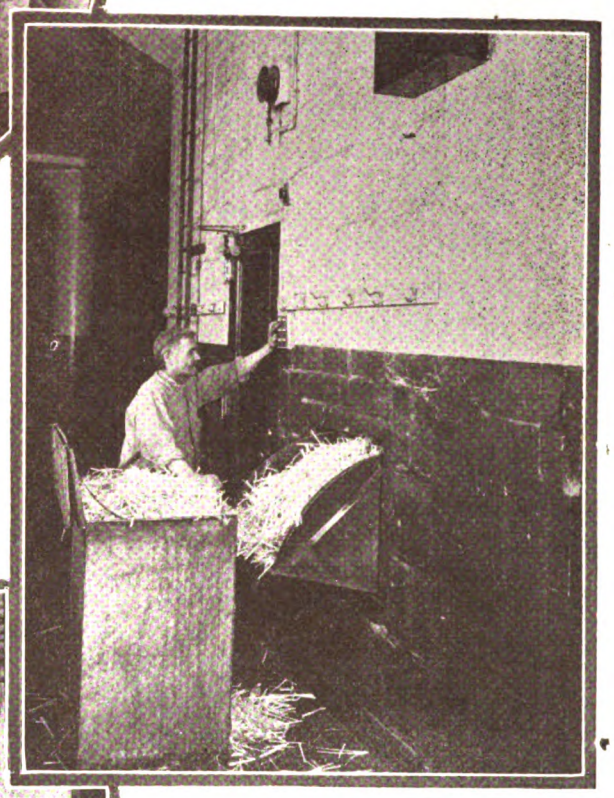
The lift truck platform is used not only for materials in transit, but also for storing sheets or books in unit quantities so that they may be readily moved when called for.

drives are used. Repairs are made on these machines in the machine shop, not on the working floor.

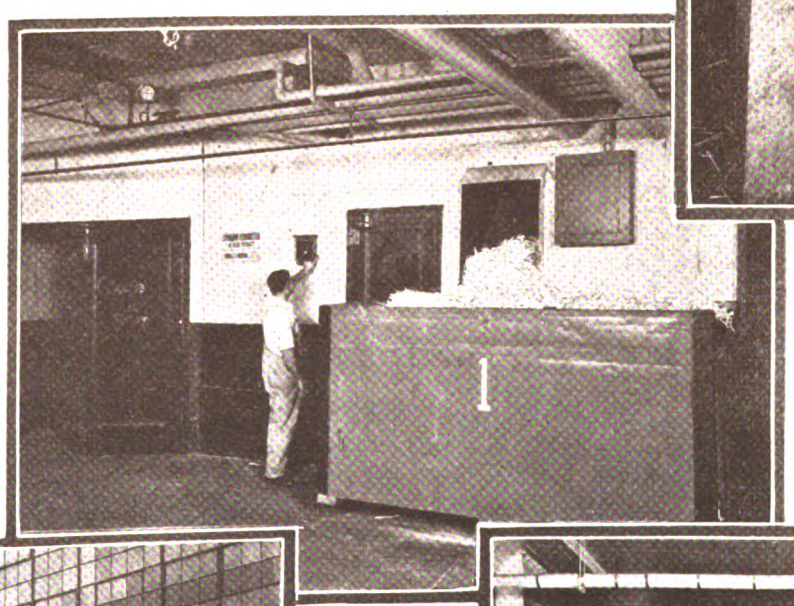
Glue pots, finishers' tools, pressing irons, food heating slabs and machines requiring heat are equipped with electric heater units of interchangeable type. Replacements and repairs are quite simple.

Many little economies possible in all industries are overlooked because they are so obvious. Take for example pressing books after they are placed in the covers. It is necessary to press and dry books for from six to twenty-four hours, depending upon the character of the binding. Upright iron presses have always been used for this purpose—we had dozens of them. Suddenly, we came to a realization that after the pressure was once applied in the press, all that was needed was a medium for keeping the pressure uniform; so we evolved a

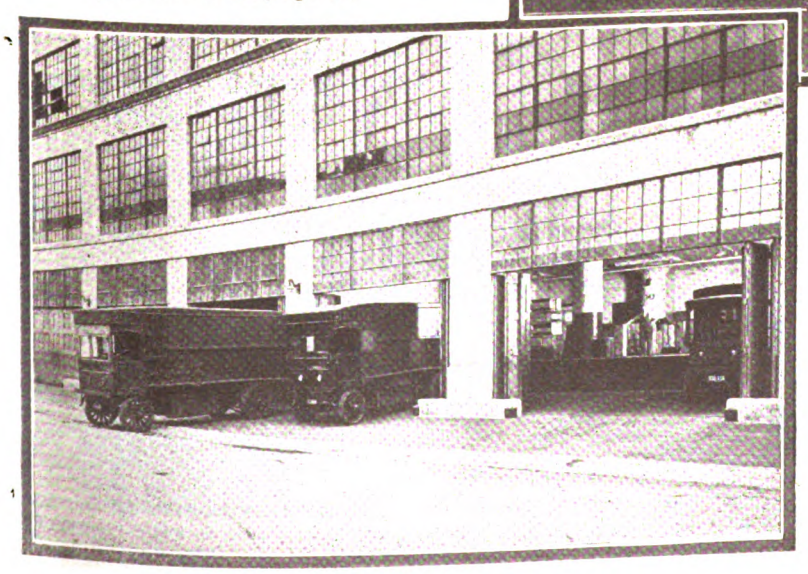
(*Continued on page 55*)



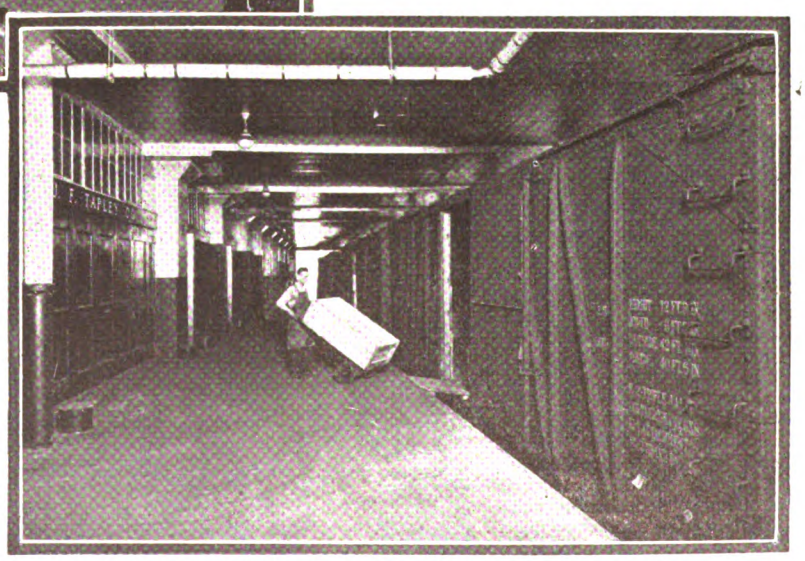
Accumulating the waste. Chute delivering selected waste into numbered bin trucks for baling. Note the indicator telling quality of waste.



Saving the waste, workman sending selected paper shavings from cutters to baling room in basement. Note the annunciator system for signalling the quality of waste.



Truck garaging, charging, loading and unloading.



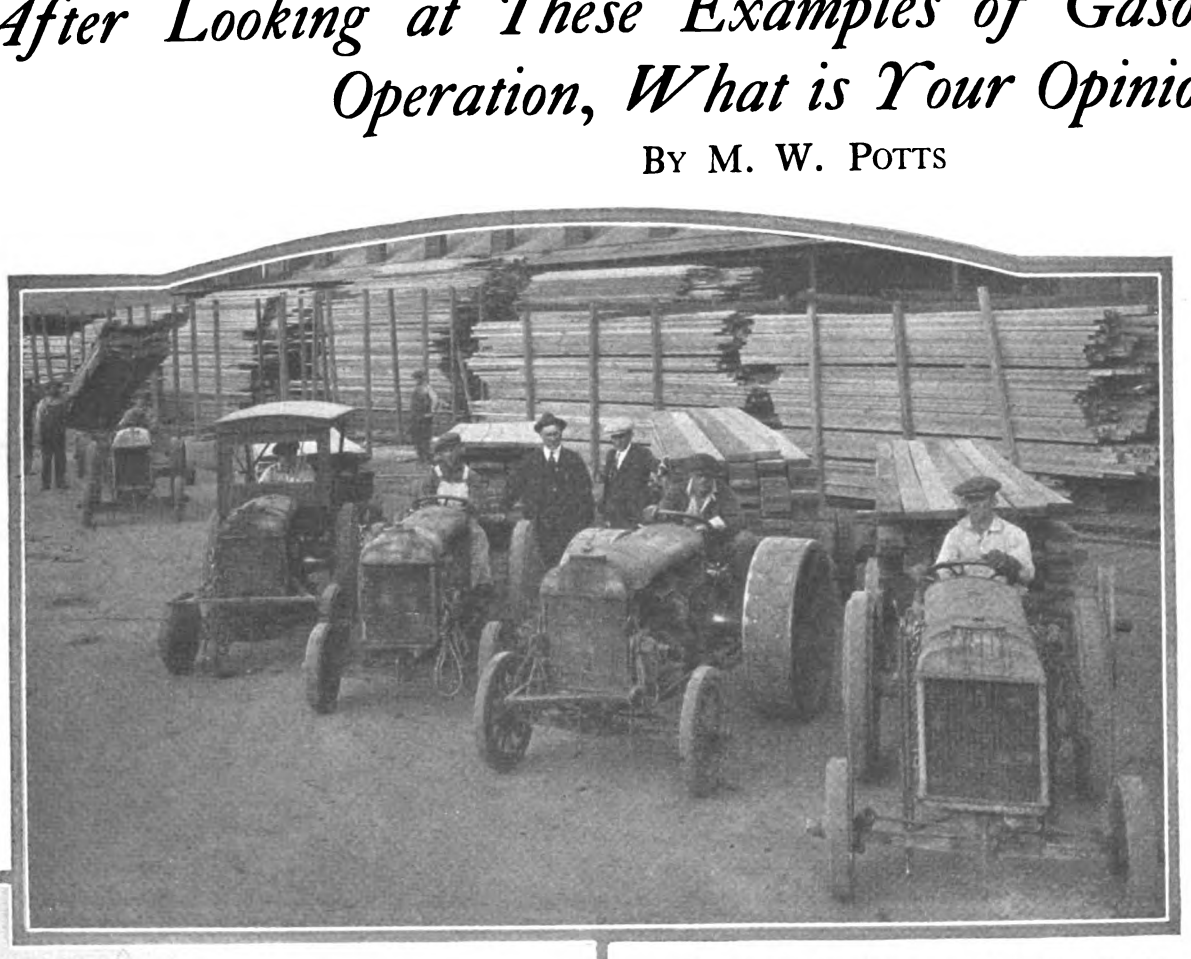
Carload shipping and receiving within the building. Notice the compartments along the platform.

Digitized by Google

Is the Field of the Gasoline Tractor Limited?

After Looking at These Examples of Gasoline Tractors in Operation, What is Your Opinion?

BY M. W. POTTS



Five of the gasoline tractors being used by the Hammond Lumber Company of Los Angeles, California. These machines have been "treated rough" but are still giving satisfactory service.



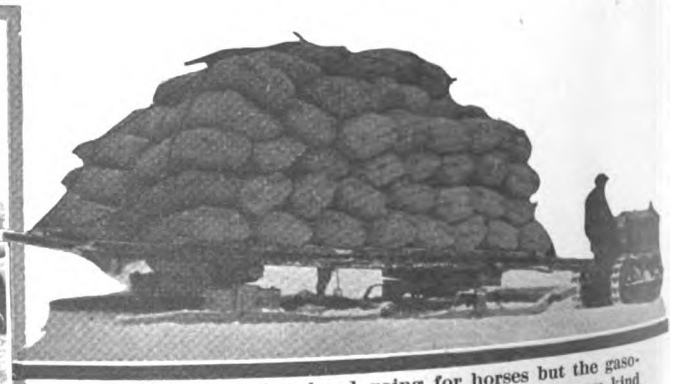
Tractors hauling an Elevating Grader and two wagon trains, at Savage—Prior Lake, Minnesota. The Grader is traveling at a speed of 3 miles per hour. After the wagon trains are loaded they haul the load away at 5 miles per hour and return empty for the next load at a speed of 8 miles per hour.



After much effort the gasoline tractor is now being used more extensively on the heavy hauling at wharfs and piers. These tractors are large and heavy, built for heavy duty and service.



The gasoline tractors are slowly working into industrial plant work. This unit is being used by the Standard Oil Company and has saved them over $4.-000 per year. They use a number of them about their yards for all kinds of work, and feel that each is producing a savings as large as this unit. The wide wheel is used to provide for bad road conditions.



Snow makes hard going for horses but the gasoline tractor of this type will run over any kind of surface. In winter some of the small outlying towns off the railroad main line have trouble getting freight and supplies. This tractor is hauling a sled of supplies in Maine.

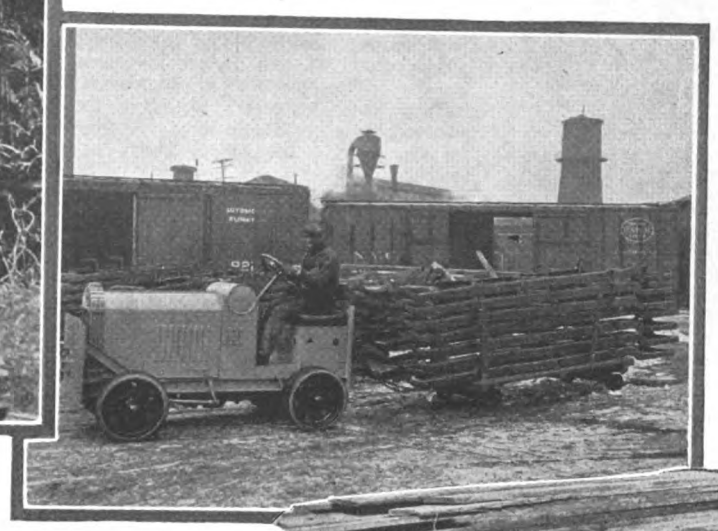
THERE are very few pieces of portable equipment that do not have one or more competitors. This is especially true in the field of material handling equipment. In this field the competition is very broad and is not limited to a difference between makes of any one type but includes the competition of different types of equipment. For instance: On the handling of materials about the yard of the plant, it can be argued that this work should be done by hand labor, by electric storage battery tractors, or by gasoline tractors. Unless all the factors entering into the problem are carefully scrutinized and understood, the wrong equipment can easily be installed with resultant failure instead of success.

It is difficult to argue broadly on this subject because every success of an installation of this class of equipment rests on the details that comprise the work to be done. The writer can therefore only show examples of what has been accomplished by the use of gasoline tractors and give a brief analysis of his own opinions why the field of the gasoline tractor, at first glance, seems to be limited. It will be noted that he says, *seems*, but like other engineers he is now of the opinion that new improvements in the design of the

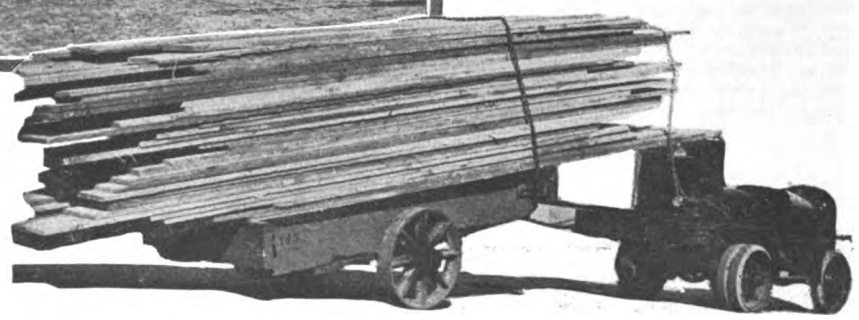
Digitized by Google



This tractor is being used by the Columbia Syndicate of South America for hauling oil field equipment to remote places. It has been found cheaper to clear a track for the tractor than it is to lay rails for a railroad. This tractor is also used in setting up the plant and clearing the site.



Industrial plants are beginning to use the gasoline tractor for general heavy hauling about the plant yard. This machine is now in service at the plant of the Peerless Motor Car Company and has been found very satisfactory. This is only one of the many uses made of this equipment.

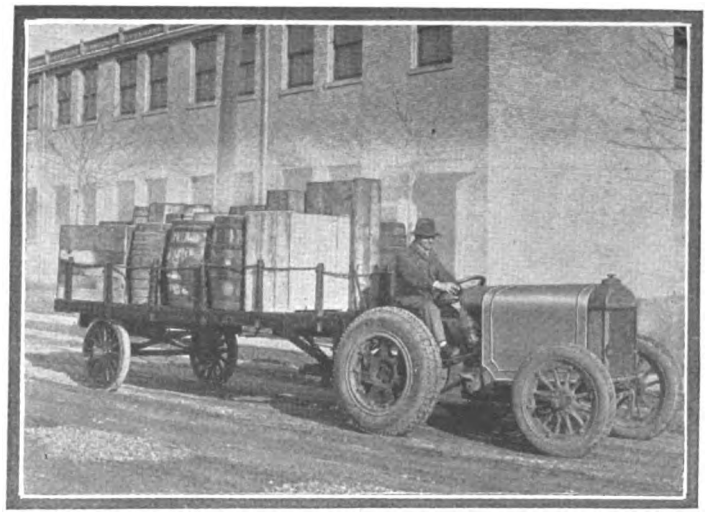


As stated before, lumber yards have made extensive use of gasoline tractors. No matter what type of trailer equipment is being used it is always possible to make a hook-up between the tractor and the trailer. Compare the trailer shown in this photograph with those shown elsewhere.

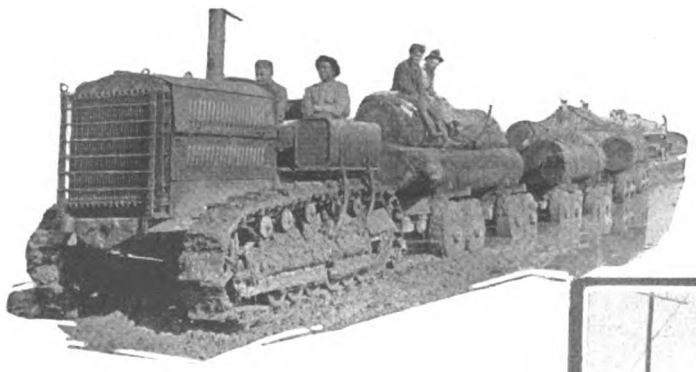
smaller gasoline tractors has greatly broadened their field.

The gasoline tractors of a few years ago were large, cumbersome machines that had difficulty negotiating in narrow aisles and through narrow doorways such as are found in the average industrial plants. Instead of the manufacturers rectifying this limitation by changing the design of their equipment, they found it more expedient to change the field of operation for gasoline tractors; consequently they took the line of least resistance and developed the use of this equipment on outside work that did not require small compact machines. Thus we find the greatest number of gasoline tractor installations on roadwork, lumber yard haulage, construction projects, farms, etc., and very few installations within industrial plants.

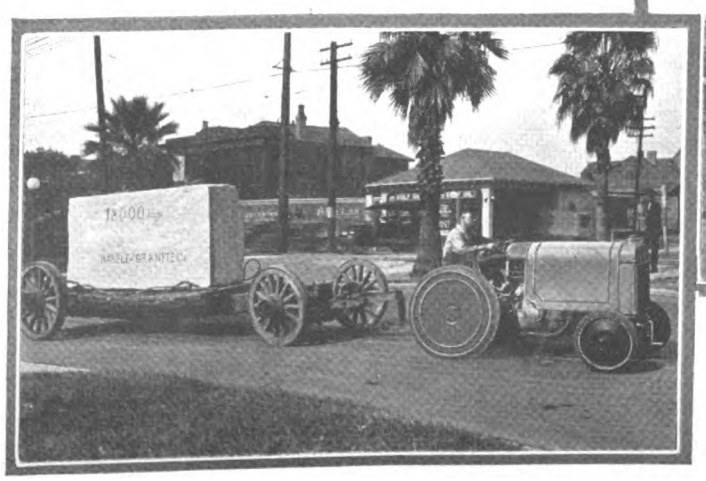
After the above mentioned field had been developed it became necessary to broaden out, but again the size of the machines was the deciding factor against them. It was, however, possible to use these large machines on warfs, bulkheads, and around supporting warehouses in conjunction with the unloading of ships. This use of the gasoline tractor brought about the new designs of small compact gasoline tractors that are on the market today. It was found that some of the electric storage battery tractors



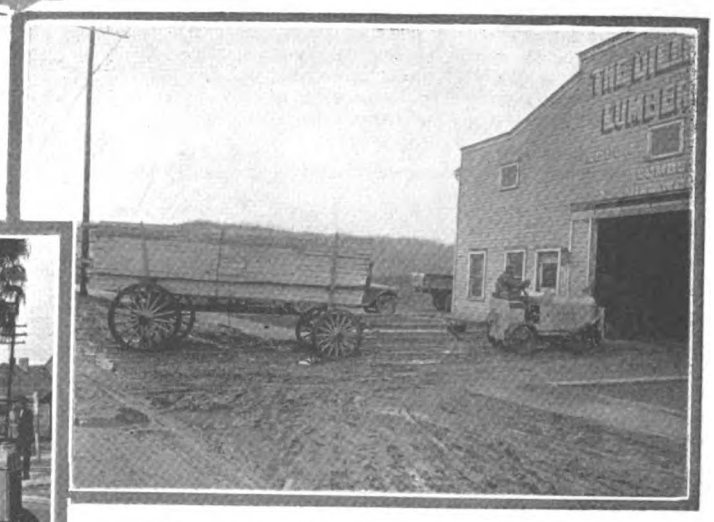
The tractor in this instance is equipped with pneumatic tires to eliminate road shock. The trailer has a 38" loading height and is called a Semi-Trailer. It can be connected or disconnected without the driver leaving his seat, and when disconnected rests on a substantial hinged prop, thus permitting the tractor unit to haul a second trailer while the first one is being loaded or unloaded.



The tractor shown is doing the work of 18 mules and doing it quicker and cheaper. The weight of the load including wagons is about 25 tons. There is approximately 3,500 feet of hardwood in the load.



Stone Quarries and Marble Works have found the gasoline tractor of value in hauling heavy loads between the quarry and the finishing plant or monument works. This shows a 9 ton load being hauled by one tractor for the A. Weiblen Marble & Granite Company of New Orleans, La.



The lumber industry uses all makes and types of gasoline tractors. In a number of instances these tractors are performing the work of many horses about the mill and storage yards. Observe how easy it is to hitch a regular horse wagon to the tractor.

Digitized by Google



How many men would be required to move this concrete mixer up the grade? This is only one of the many uses that can be made of a gasoline tractor.

This rotary sweeper is a great time and money saver to the industrial plant that has to clean its own roads. The broom is balanced, raised and lowered, stopped or started by special devices. While it takes its power direct from the engine, it is driven independently of the motion of the unit.





The Globe Seamless Tube Company use gasoline tractors for hauling trailers in all departments of the plant. This photograph shows one working over uneven ground, hauling refuse material to the dumps.

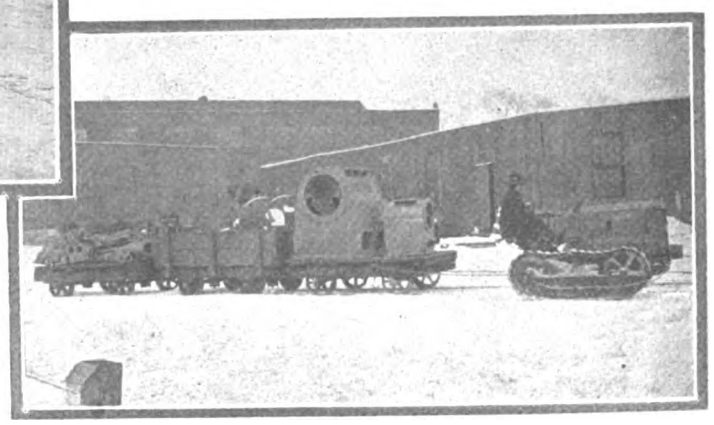
operating on docks and railroad transfer floats had to carry a large battery capacity in order to operate the full day, and even with this large battery capacity it was necessary to give them a booster charge at noon. The gasoline tractors were brought into service on this work but they had trouble operating in the confined aisleways and consolidation spaces due to their size. This brought about a change in design which has considerably broadened the field of gasoline tractors.

A few of the various types and makes of gasoline tractors are shown in the accompanying photographs. There does not appear to be any limit to the fields in which they *can* operate. The new design of tractors, more compact and with shorter turning radius, has opened the field of industrial plant haulage, which up to this time has been closed. Now the gasoline tractor can operate in narrow aisles and congested spaces in competition with the

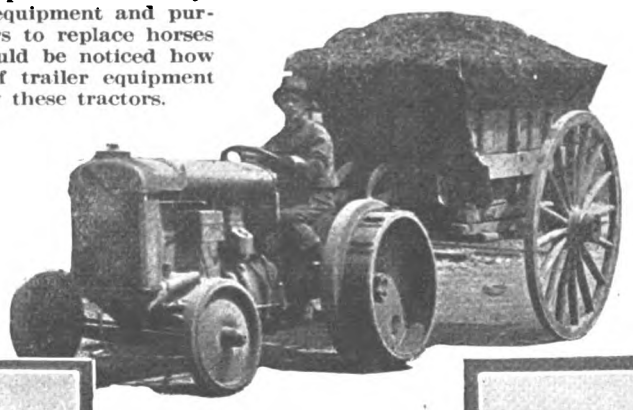


Industrial plants, towns and cities have found the gasoline tractor to be the best medium in connection with their snow removal. Several types of plows have been designed to operate with the gasoline tractors.

The Worthington Pump & Machinery Corporation of Holyoke, Mass., use a gasoline tractor as a locomotive on their industrial railroad. They also find it advantageous for hauling heavy loads about their plant where tracks are not provided.



A number of industrial plants are modifying their horse-drawn equipment and purchasing gasoline tractors to replace horses for yard work. It should be noticed how many different types of trailer equipment are being hauled by these tractors.



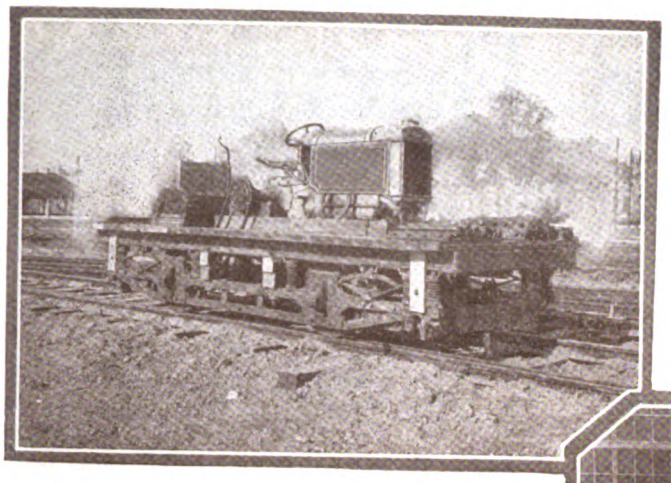
Spotting cars and making shifts in the daytime is often impossible because the "Regular railroad locomotive only makes one shift per day." To move a car 50 or 100 feet will often save many dollars.



The Vulcan Steam Railway Company found use for a gasoline tractor in building bridges and laying tracks. In working on this bridge the tractor spaned the space between girders and carried materials back and forth without interfering with the track laying crew.



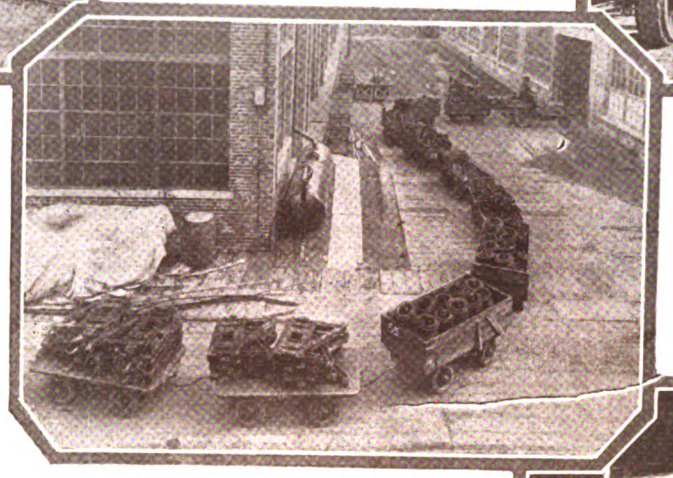
Digitized by Google



Various means have been employed for using gasoline tractors as locomotives to operate on rails. This unit, operating as shown, pulled a 45 ton load over a test period. The maintenance cost over 6 months' constant use has been less than $10, chiefly for regrinding valves.

The tonnage of this tractor train is not known. The trailers are of the four-wheel-steer type and are roller bearing equipped. Note how each trailer follows the preceding one. How many men would it take to move this load?





On grade work the gasoline tractor is in its element. Many industrial plants whose operating floor is above the yard level have found them most efficient for hauling raw materials into the shop. This is a good example of the class of grade work that the gasoline tractor can negotiate.

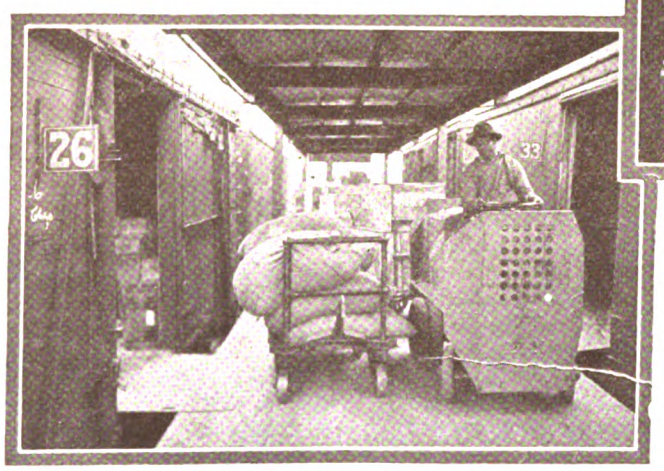
electric storage battery tractors.

It has been shown that there is a type of tractor particularly adapted to every industry and that every industry can economically use one or more gasoline tractors. The captions under the pictures tell the story. The uses shown are only a few of the many that have been made of this equipment throughout the country. As these tractors are now being used in industrial plants it is natural that new uses are being developed. Why then need we feel that the field of the gasoline tractor is limited? We need not. And if the tractor manufacturers will slightly change their designs and make them more compact they will find that industrial plants can use their equipment. That has been the experience of one gasoline tractor manufacturer who now

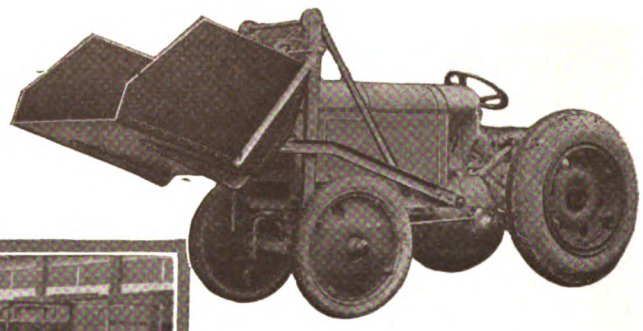
(*Continued on page 65*)



The Stevedoring firm of T. Hogan & Sons. Inc. on pier 58, North River, New York City, which belongs to the International Mercantile Marine Co. (Atlantic Transport Line) have found this tractor trailer method of hauling freight to be very efficient and economical. The trailers are of steel construction and roller bearing equipped.

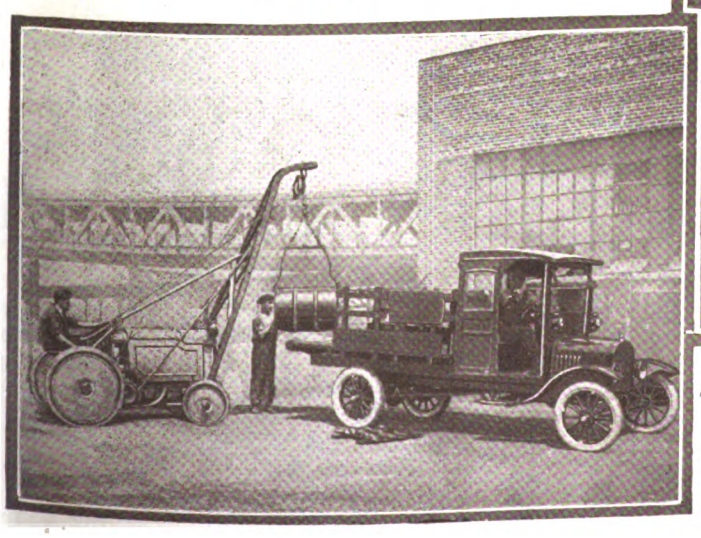


For years the gasoline tractors have been large and cumbersome. The latest, designs in gasoline tractors, are closely following the small compact lines of the electric storage battery tractors. This gasoline tractor can operate in narrow aisles and conjested spaces, it has a turning radius of 5′-3″ It is shown operating on a railroad float.



The automatic dump scraper attached to a gasoline tractor unit, loads its own scoop with half a yard of dirt or other material, carries the load to what ever point is desired and dumps it there, all these operations being performed by the operator without leaving his seat.

This portable traveling crane is integral with the gasoline tractor unit and is operated in connection with a capstan winch on the side of the tractor. It will raise a half-ton load 9 feet from the ground, and while so suspended the load may be carried to any desired location and lowered with perfect control. All operations are performed by the driver without the necessity of leaving his seat.





For hauling freight from bulkhead to cars on floats the gasoline tractor has been found very efficient. The ramp between float and bulkhead is often on a steep grade due to high or low tide. This grade work has been a stumbling block for the electric storage battery tractors.

Digitized by Google

The Preparation and Burning of Pulverized Coal

Equipment and Process that Cuts the Coal Bill

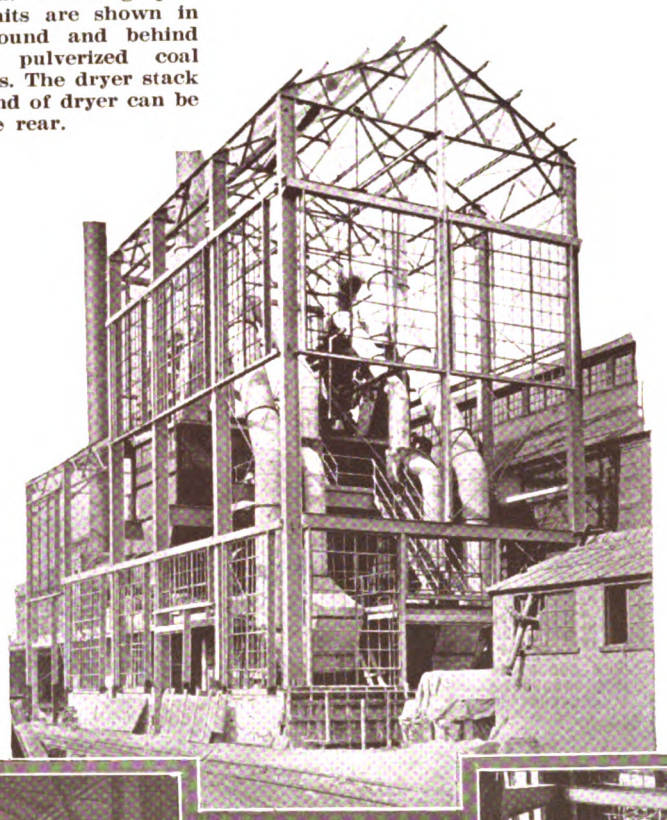
BY HOMER L. RANK

IT IS an astonishing but well-established fact that the possibilities of pulverized coal firing are not generally known, even in engineering circles of large diameter and wide range. For example, only those members of the profession or men whose industrial duties have compelled them to delve into archives of cost-reducing devices, realize that patents on coal-pulverizing machines for direct firing were granted nearly eighty years ago! It is more generally known that finely ground coal has played an important part in the manufacture of Portland Cement for many years, having been burned in that form in kilns where cement "clinker" is made.

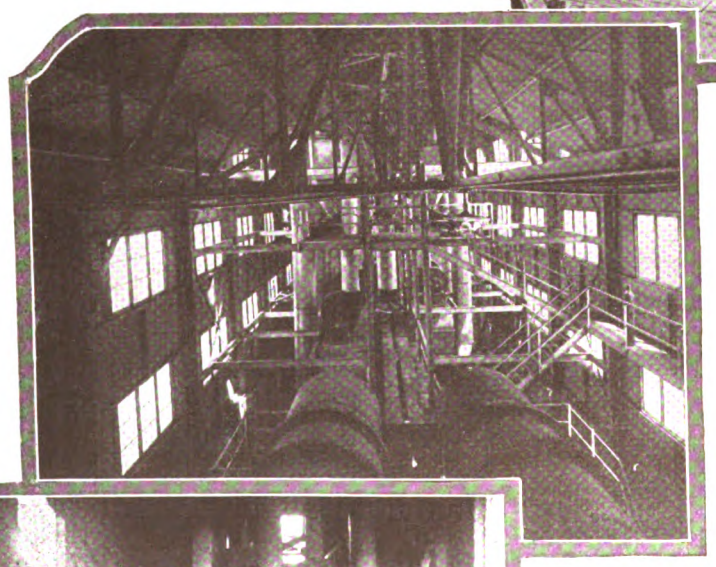
Thanks to the years of improvement and development in the Cement Industry, coal pulverizers—machines for reducing bituminous coal, lumpy, to powder—have long since passed out of the experimental field, and there are several machines on the market today, successfully performing this function, economically and with uniform results, regardless of the quality of fuel fed to them.

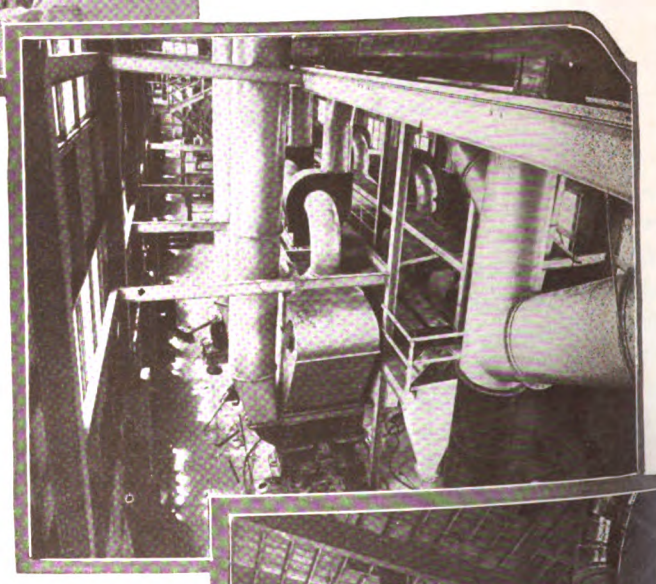
Why is it necessary to reduce coal to powder form, spending thousands of dollars for equipment to perform this work, and what are the *direct* advantages to be gained, over present modern methods of mechanical firing?

Before attempting an answer to this important compound question, it may not be

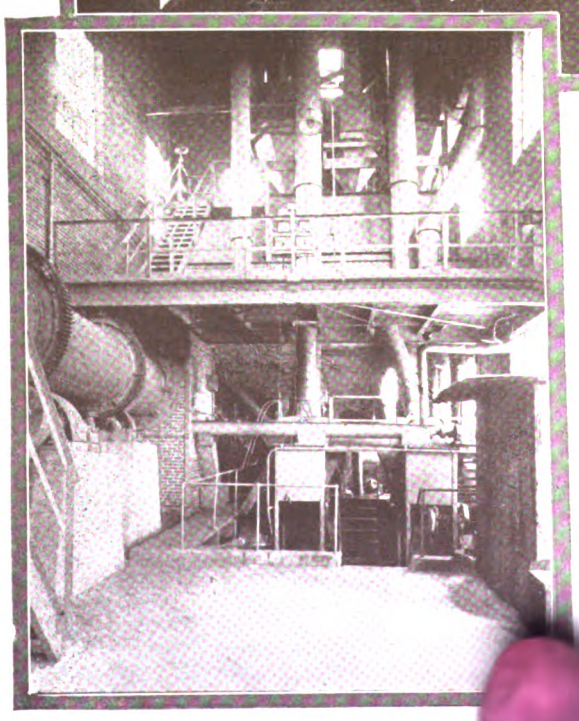


Central coal pulverizing plant during the process of construction. Two large pulverizing units are shown in the foreground and behind them are pulverized coal storage bins. The dryer stack and feed end of dryer can be seen in the rear.





Above—Two views of the interior of coal pulverizing plant showing details of pulverizer and silent chain drive together with exhauster and separator above pulverizer.

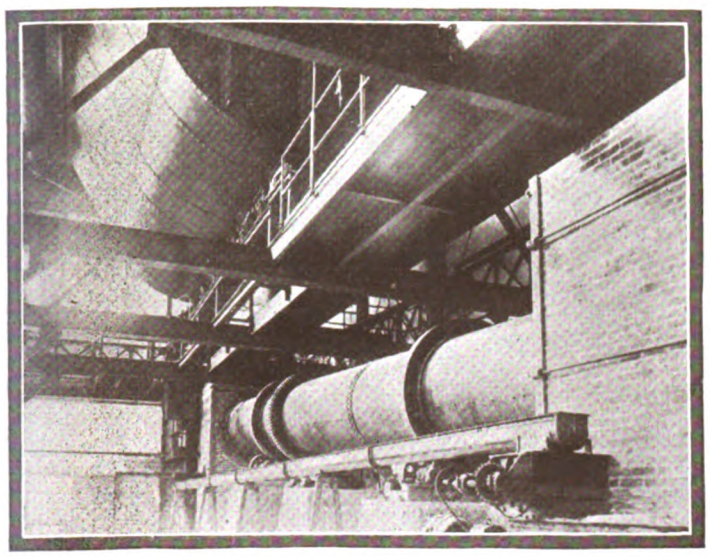


Coal dryer on the left and pulverizers behind the small feeder bins in the center, below. The coal dust collectors on top of the bin are shown above and the low pressure fan together with distributing pipe is in the left rear behind the pulverizers.

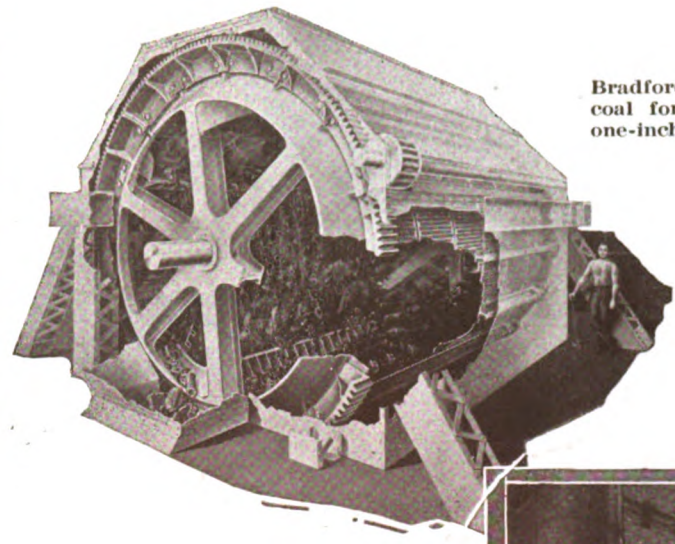


Upper floor, showing exhaust fans which deliver coal and air from pulverizer to coal dust collectors located over storage bins. The air returns down center pipe to pulverizer.

Digitized by Google

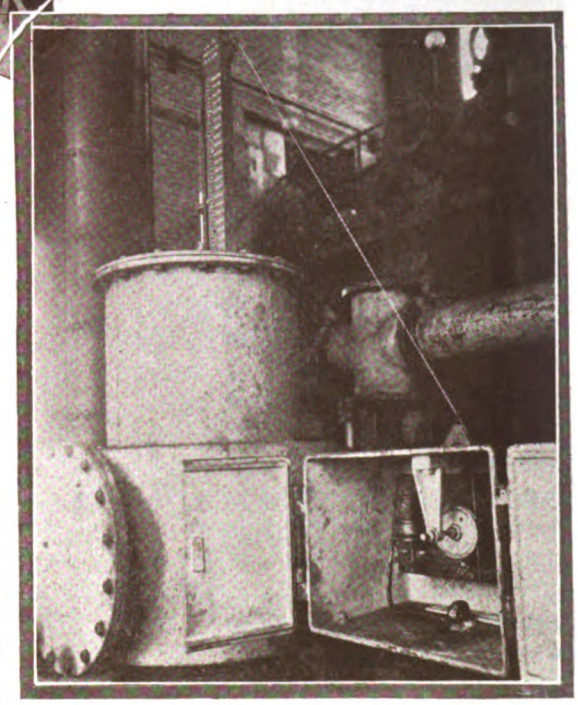


Storage bunker, with conveyor under same, delivering through automatic scale to rotary dryer.

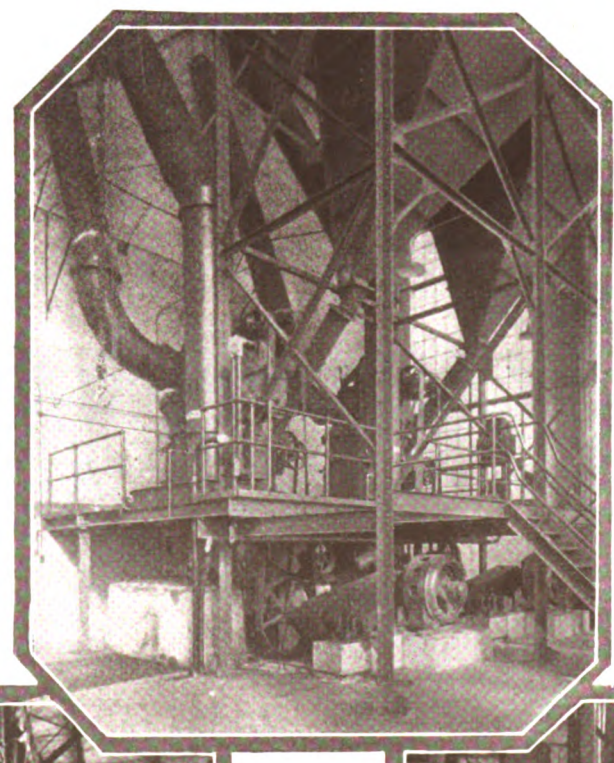


Bradford Breaker; which prepares the coal for pulverizing, by crushing it to one-inch size.

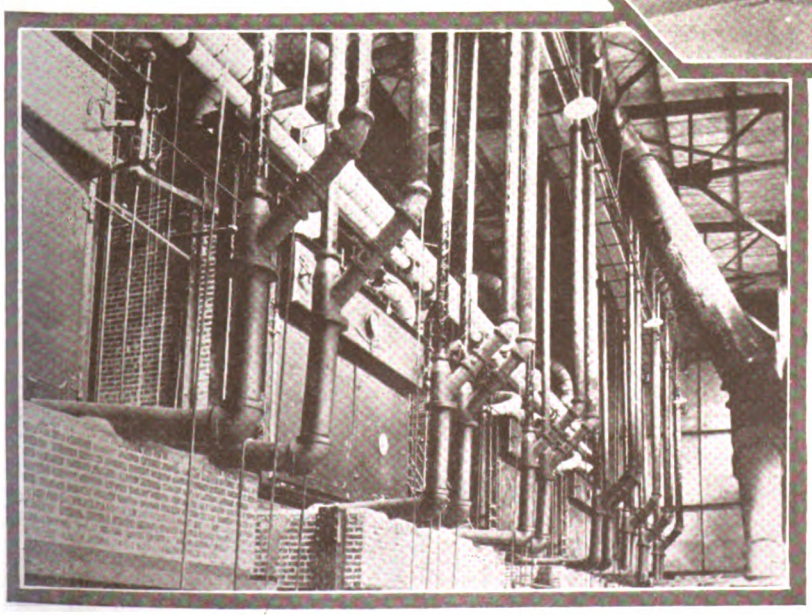
amiss to paint a brief word-picture, entitled, "Burning a Lump of Coal." Before the combustible content of a lump —a one-inch cube, for example —can be released for combustion, the lump must first be heated to the point where it develops more heat than it receives. No fuel will burn until the molecules which form it have been brought to this self-supporting condition by the heat absorbed from particles previously burned around it. Not only must the fuel itself be heated to the temperature requisite for combustion, but the air also, which surrounds each particle of fuel. A 1″ cube of coal exposes six square inches of surface area for absorption and liberation of heat, while the same cube, pulverized so that 90% will pass a 200-mesh screen, exposes an area of approximately *eight square feet,* at the same time



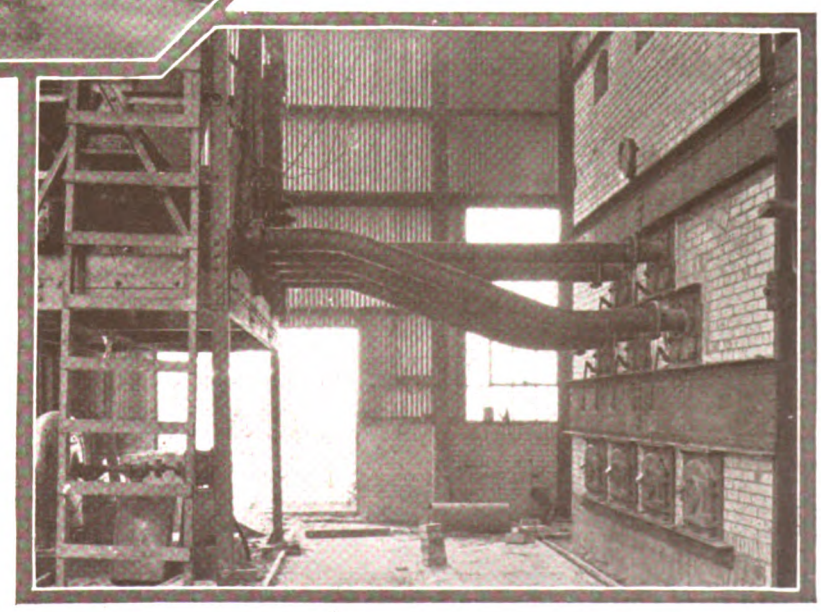
General view of a 2-mill preparation plant, showing dried coal storage bins overhead. Note well lighted, accessible arrangement of machinery.



Automatic mechanism for feeding pulverized coal from the central storage bin into the low pressure air distributing circuit in fixed proportion to the amount of air flowing. As more burners are added or cut off from the circuit, a float in the left-hand chamber automatically raises or lowers, thus changing the position of the rheostat in the box.

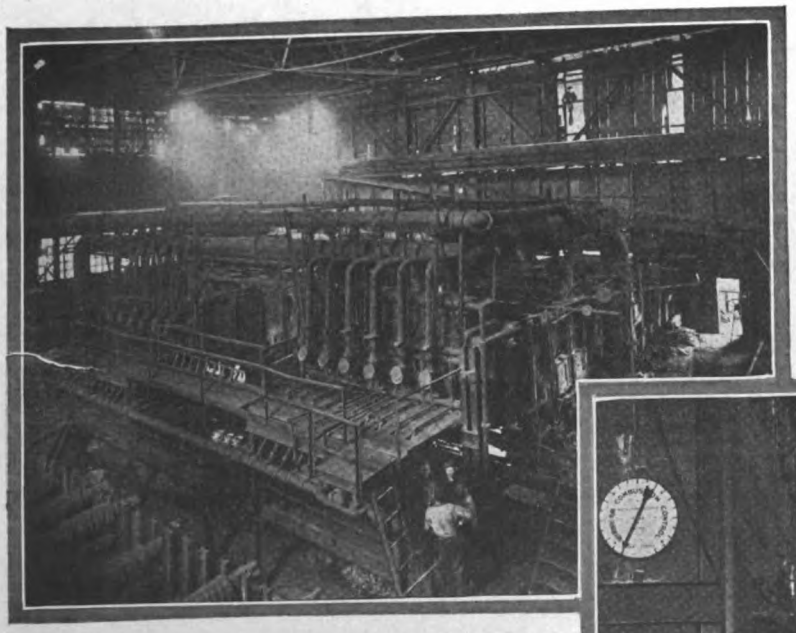


Application of pulverized coal to 4—750 hp. boilers. The inside vertical pipes carry a mixture of coal and air from the pulverizing plant. The right-hand vertical pipes furnish the necessary additional air to produce proper combustion conditions at the burner tips.

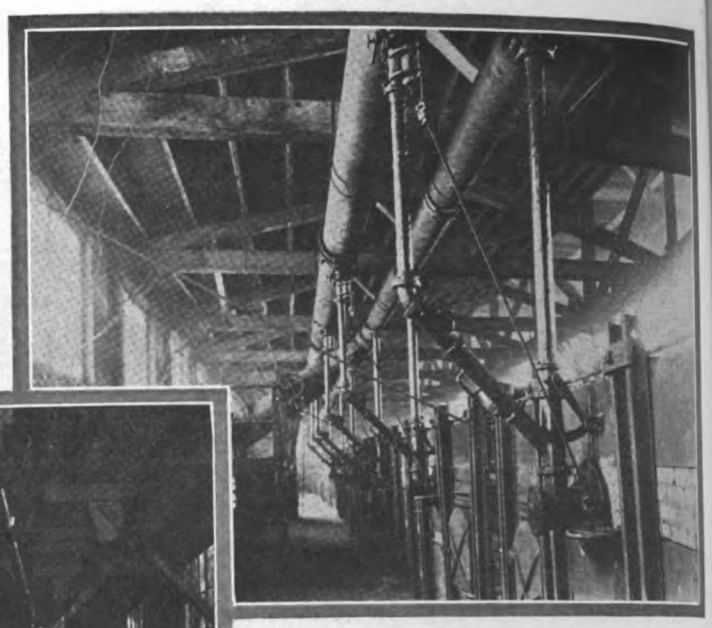


Showing method of firing combustion chamber under boiler, from individual storage tanks (shown on the left) by means of mechanical feeders and secondary air blast.

Digitized by Google

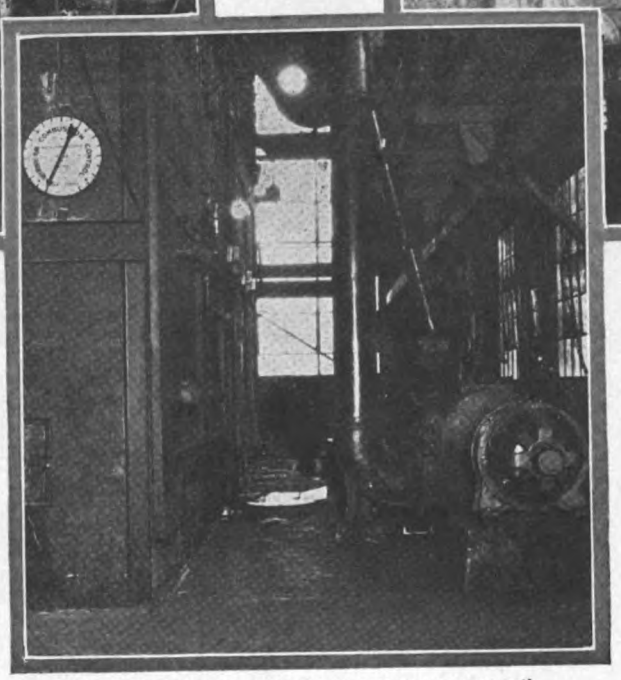


Rod heating furnaces for nut and bolt machines fired with pulverized coal. The upper pipe circuit carries a mixture of pulverized coal and air. The lower pipe furnishes necessary additional air at the burner to permit perfect combustion.



A row of malleable iron annealing ovens equipped with pulverized coal burners. The left-hand pipes contain a mixture of pulverized coal and air. The right-hand pipes furnish the necessary additional air to support combustion in the furnace.

surrounding each particle of coal with sufficient oxygen (carried in fan-fed air) to cause its instantaneous and complete combustion. A simple calculation shows that the power to burn has increased nearly seven hundred times. It becomes immediately apparent that, in a bed of fuel as on a mechanical stoker, a certain amount of heat units are wasted, due to the fact that some heat is lost from incandescent particles, while bringing up the temperature of the cold particles surrounding them, this loss being proportional to the percentage of large lumps of fuel and quantities of excess air to be heated. Further, it is readily seen that coal, in pulverized form, is *fully prepared* for complete and immediate combustion (as



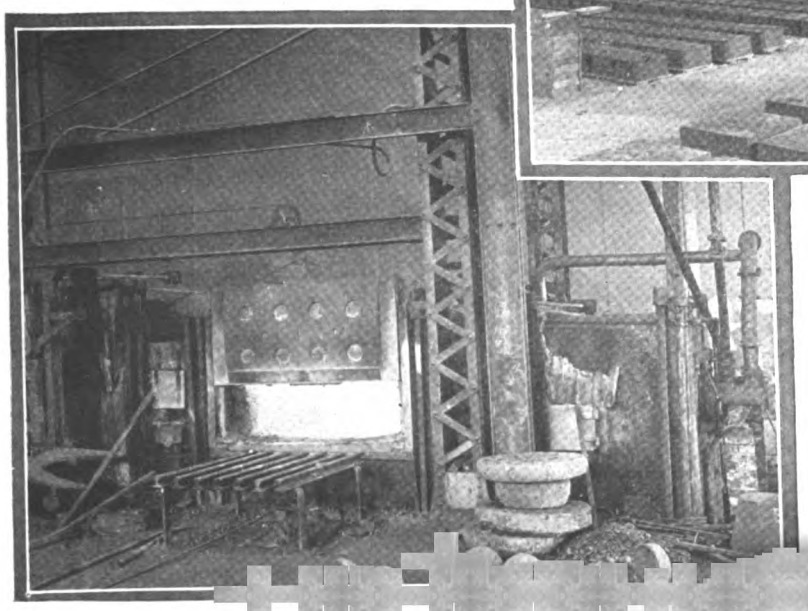
Typical application of the "direct-firing" system. "Green" coal spouted from storage bunker overhead to pulverizer, (without preliminary drying) and blown directly to combustion chamber under boiler.

Below—Typical malleable iron melting furnace showing moulding space around same and pulverized coal burners applied at the right-hand end.

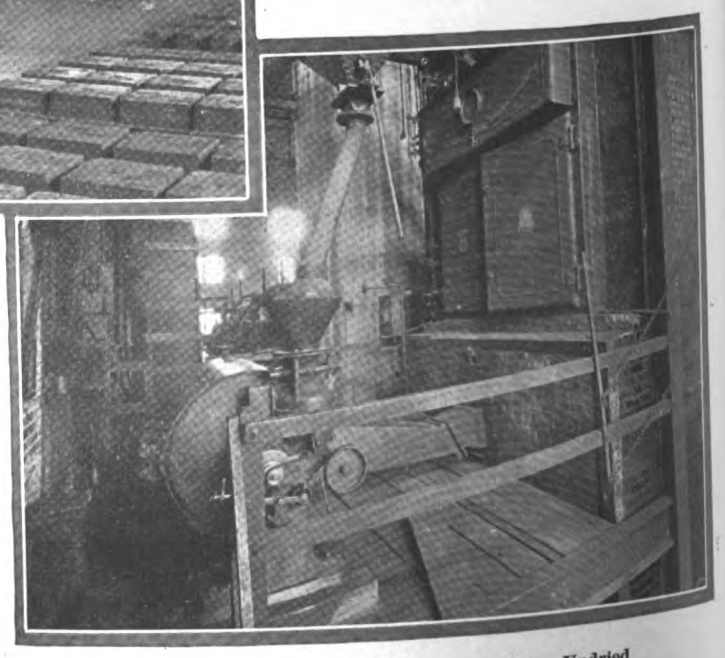
witness the flame at the end of a typical pulverized coal burner). The coal and "secondary air," having been properly mixed in a chamber just outside the burner, enter the furnace at a velocity of several thousand feet a minute. The flame plays right up against the metal burner, without smoke, clinkers, or ash, except an almost impalpable powder, which disappears in the air, much the same as mist before the sun.

It is not difficult to conclude, in a general way, that coal can be most economically burned—industrially—in pulverized form. Actual installations, operating over a period sufficiently long to prove every phase of the word "economy," in metallurgical work or steam

(*Continued on page 28*)



Heavy billet heating furnace showing pulverized coal burners fired through end wall into combustion chamber.



Direct-firing unit applied to boiler. Undried coal passes from overhead storage through automatic feeder, to pulverizer, and is blown to combustion chamber. Note compactness of this self-contained unit.

Digitized by Google

What Building Means to Business

The Close Economic Relation Between Construction Work and the Demand for Manufactured Products

BY ERNEST BRADFORD

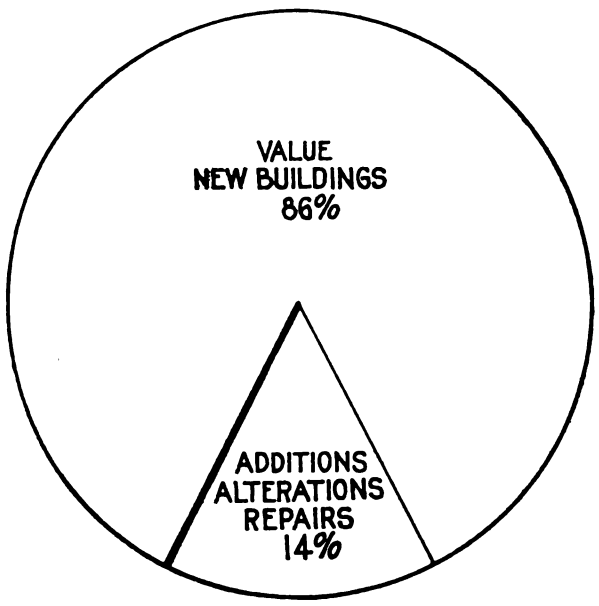


Fig. 1. A graphical presentation of the proportionate value of new buildings, to additions, alterations and repairs.

THE manufacturer of products used in factories and stores, office buildings, dwellings or other structures, watching the unusual volume of construction work going on during 1922, has asked himself the question, what does building mean to business? Does it forecast increased sales for the butcher, the baker, the electric lamp maker, and all who supply their needs? Does it point to a greater demand for the products used by industrial concerns—power machinery, pipe, wire, conveyors, steam turbines, trucks, lubricating oil, waste, hose, belting; and for personal consumption goods such as washing machines, refrigerators, furniture, textiles, shoes, foodstuffs, candy, books, mechanical toys? Just what does it mean to those who manufacture and sell factory products?

To bring together some of the available facts bearing on this live and timely question is the purpose of this article, so that as the season of 1923 begins, and buildings again go up on every hand, the significance which the volume of construction has as a barometer of industry may be more fully appreciated.

The primary position which building occupies in our business structure is obvious from a glance at its relation to the

(*Continued on page 67*)

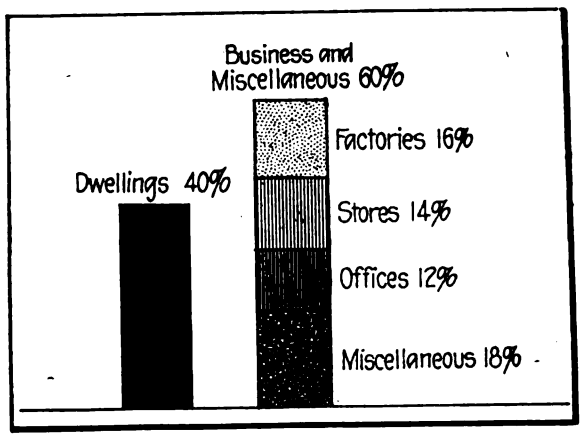


Fig. 2. Classification of Buildings constructed annually, showing proportions (value) of each type.

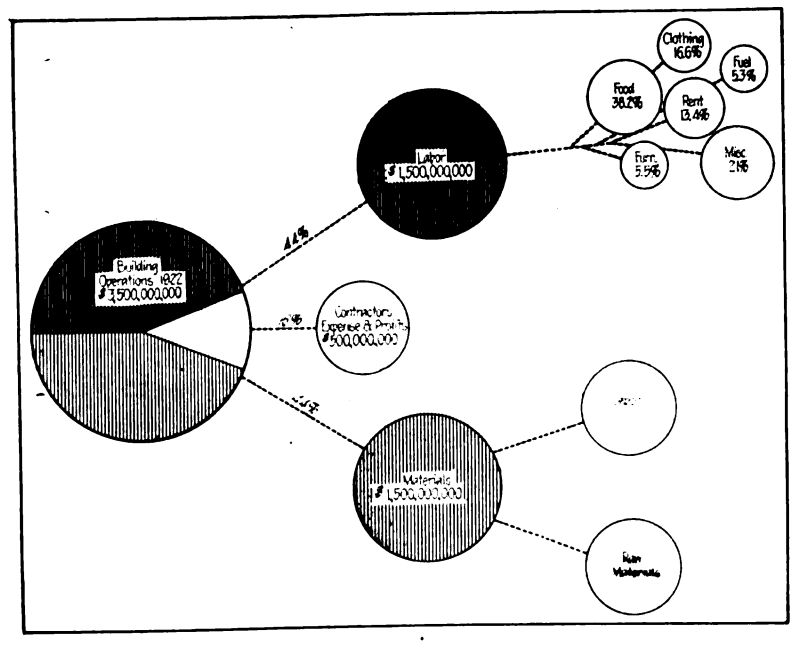


Fig. 3. Divisions and subdivisions of the "building dollar," showing where the 4½ billion dollars goes.

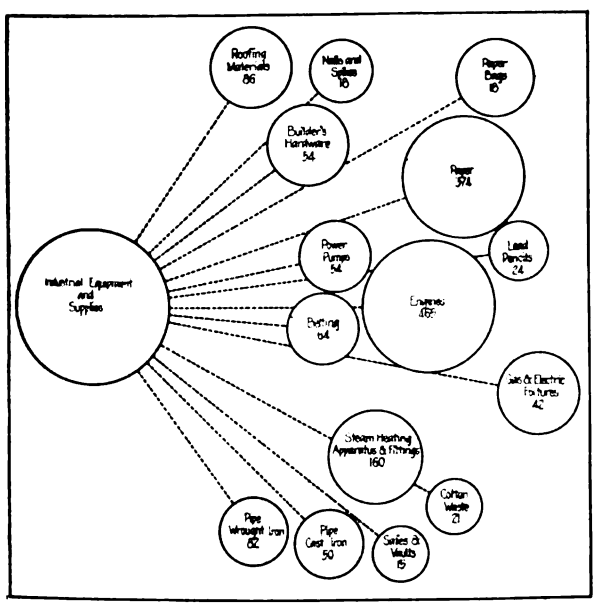


Fig. 4. The figures in the small circles represent (in millions of dollars) the value of the various items for the year 1919 and reported by the census of 1920.

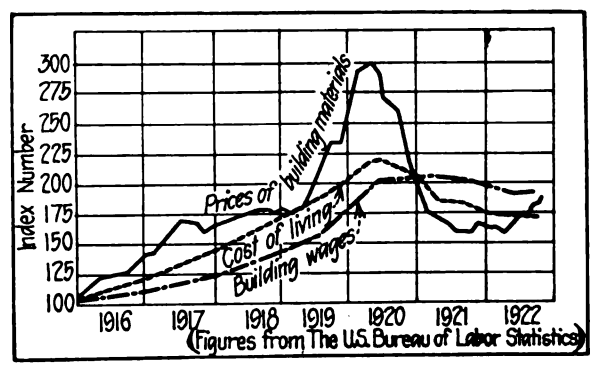


Fig. 5. A graphical comparison of (a) Building Materials Prices, (b) Building Wages and (c) Cost of Living, from 1916 to 1922, inclusive.

Digitized by Google

Automatic

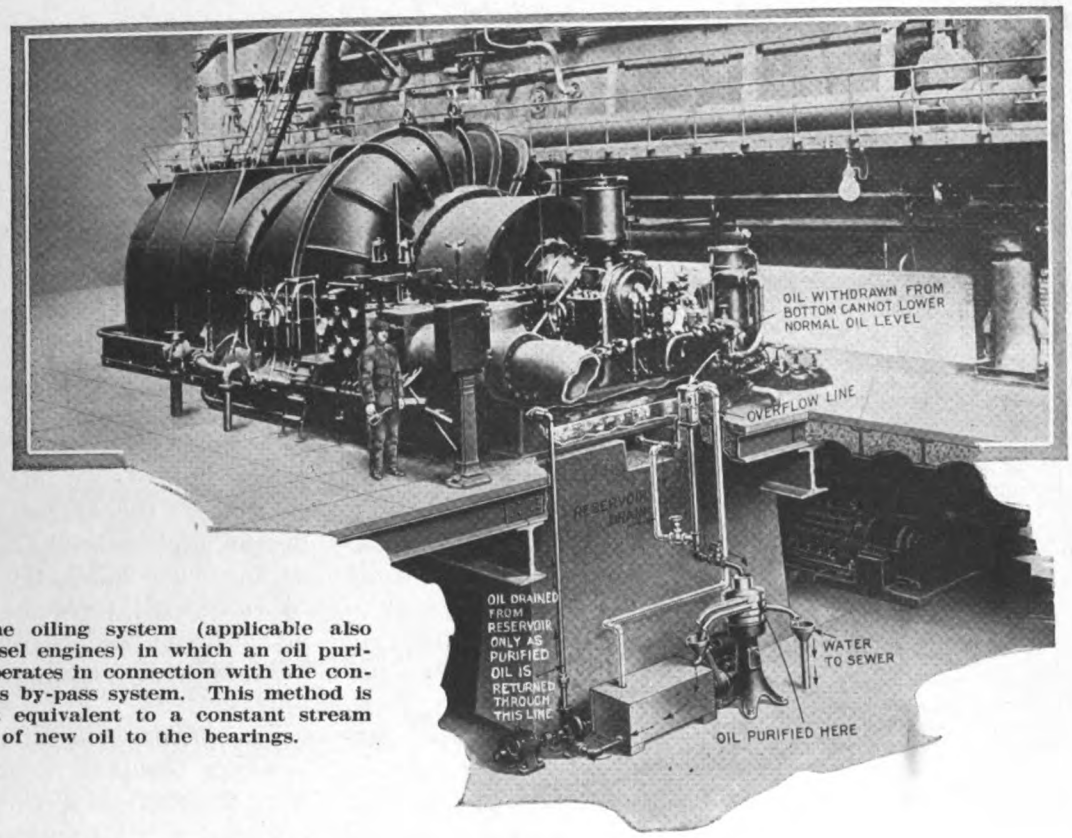
Making Sure of Proper Oiling

By Allen

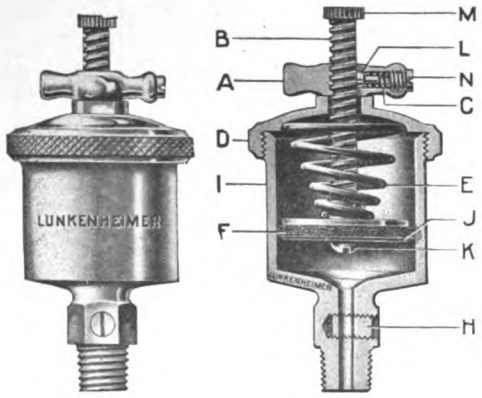
THE development of industrial machinery to its present-day state of efficiency has brought a marked influence to bear on the perfection of accessory equipment. There is no doubt that but for these latter appurtenances the modern power plant would be greatly handicapped in producing the steam and electricity so essential to our daily life.

Among the above equipment automatic lubrication devices play a most important part in insuring the constant and efficient operation of machinery at all times, the maintainance of repair expense at a minimum, and the economical and positive usage of lubricants. Lubrication today is looked upon as one of the most vital factors with which the operating engineer has to deal. The era of "hit or miss oiling" and the "old tallow pot" has passed into the discard, to give way to an age of scientific usage of lubricants that few of us ever anticipated. The relation that proper lubrication, systematically carried out, bears to general plant efficiency is admittedly one of the most important features of modern plant management.

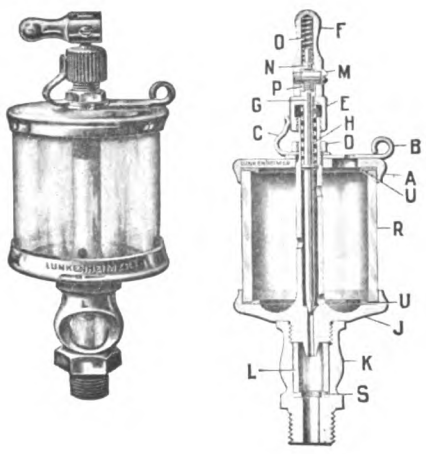
Automatic lubrication can be



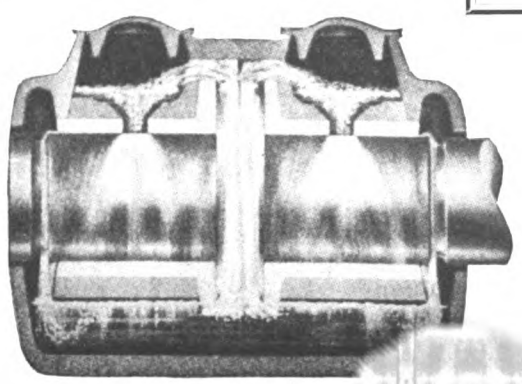
Turbine oiling system (applicable also to Diesel engines) in which an oil purifier operates in connection with the continuous by-pass system. This method is almost equivalent to a constant stream of new oil to the bearings.



Sectional and exterior views of a compression grease cup; a type of lubricator developed to meet the need for inexpensive installation and merely periodic attention.



Sectional and exterior views of a glass body oil cup, equipped with sight feed and snap layer for control of oil flow.



Phantom view of a fixed collar type oil bearing, commonly used on flour roller mills. Such a bearing is in reality an oil gusher, and flood lubrication is continuous.

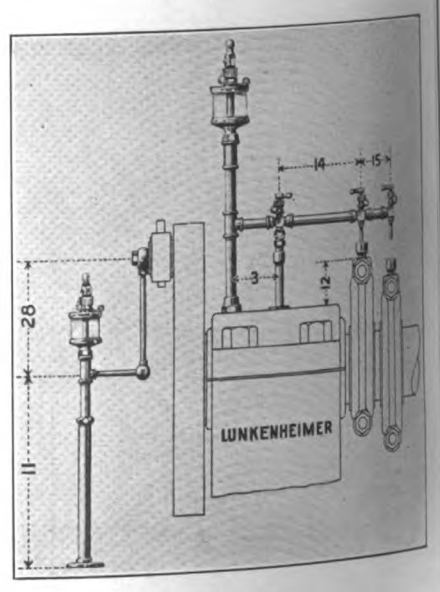


Illustration of equipment for oiling crank-pin, pillow blocks and two eccentrics by sight feed oil cup distribution.

Digitized by Google

Lubrication

By Doing it Mechanically

F. BREWER

divided essentially into eight distinct classes, *i. e.*

Waste pad lubrication.

Sight feed oiling devices, and compression grease cups.

Self-oiling systems such as ring and chain oilers.

Gravity feed systems.

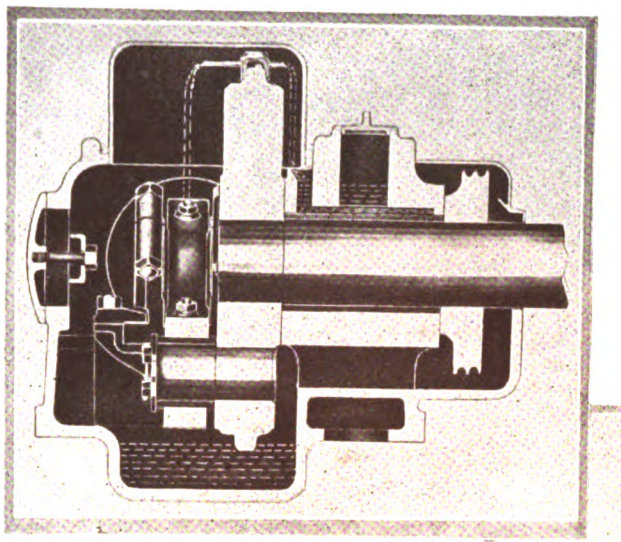
Circulating gravity feed systems.

Mechanical force feed lubrication.

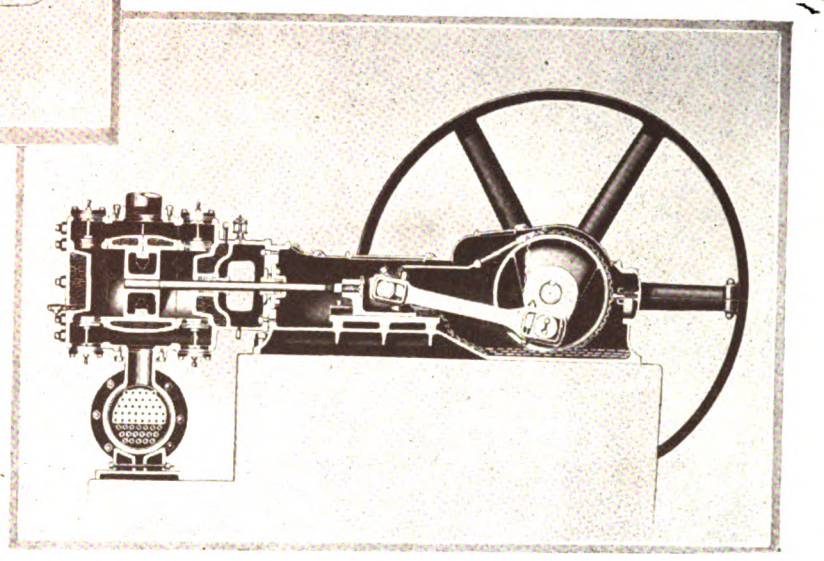
Splash lubrication.

Steam cylinder lubrication. (Hydrostatic and force feed.)

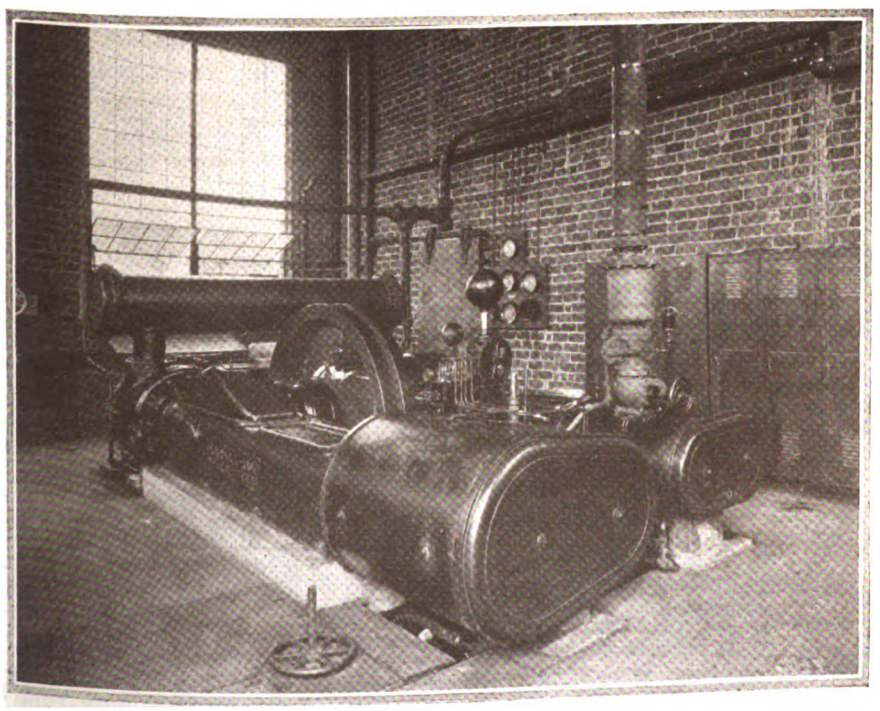
Probably the first departure from the crude method of oiling by hand feed with an oil can, was the adoption of waste pad lubrication. It was early appreciated that hand oiling was decidedly wasteful and most unsatisfactory since generally the oil would run through the bearing and drain out within a few minutes after application. So, to make the oil remain longer in service bearings were built with a shallow reservoir surrounding the oil hole, and a pad of waste laid therein. This was periodically saturated with oil and served a dual purpose: To prevent the oil from passing too rapidly into the bearing and to prevent



At the left—Illustration of the principles of crank case lubrication. This design enables the oil to be picked up by the crank disc and carried to the uppermost part of the disc. Here it is scraped off (as indicated below) and led to the crosshead pin and crosshead.



End view (cross section) of crank case of engine shown above, indicating the manner in which oil is distributed to the crankpin and other movable parts.



Typical example of modern automatic lubrication equipment installed on an air compressor. Note force feed lubricator with piping; auxiliary steam cylinder lubricators; and piping for splash feed oil distribution.

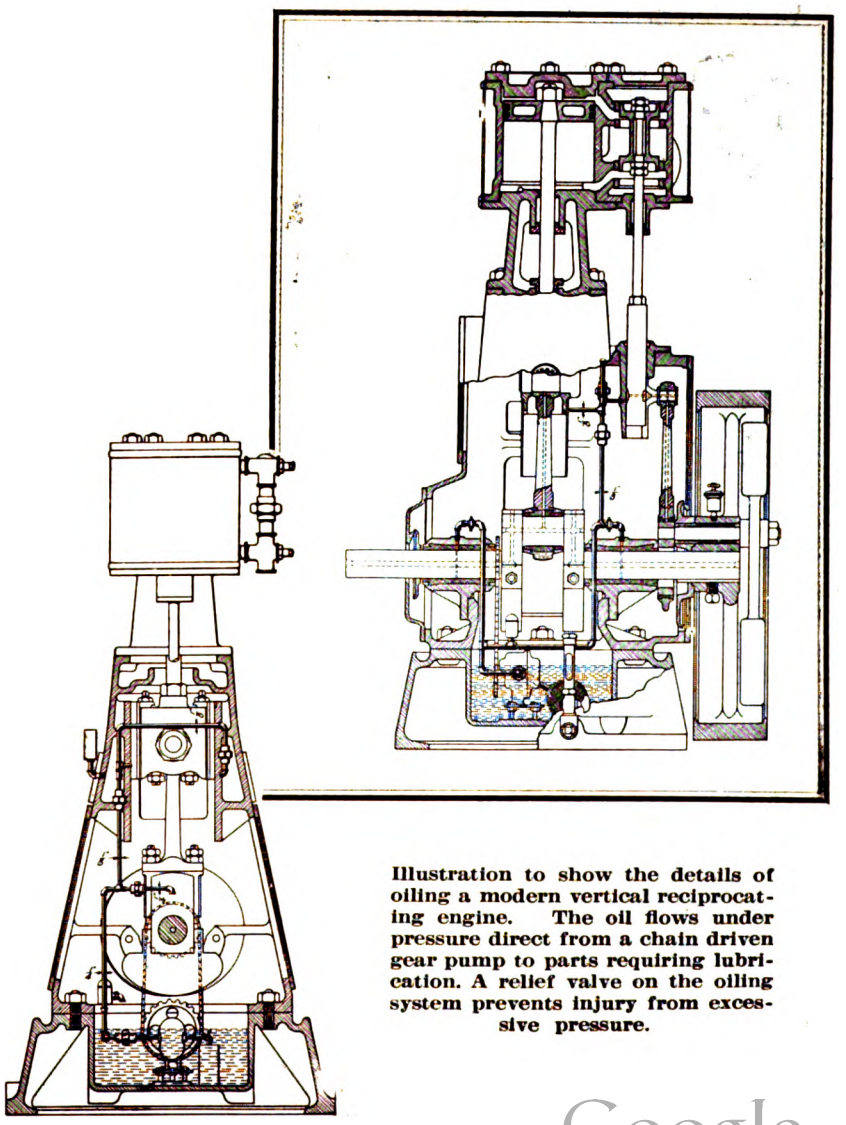
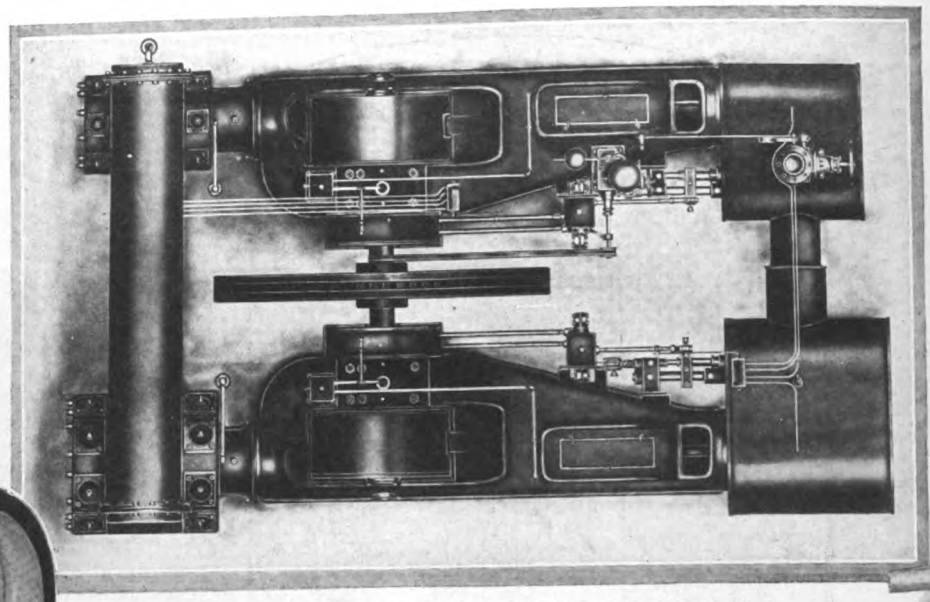
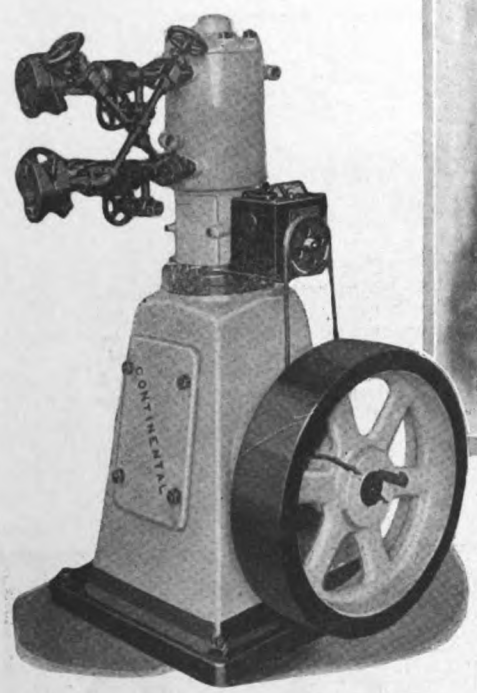


Illustration to show the details of oiling a modern vertical reciprocating engine. The oil flows under pressure direct from a chain driven gear pump to parts requiring lubrication. A relief valve on the oiling system prevents injury from excessive pressure.

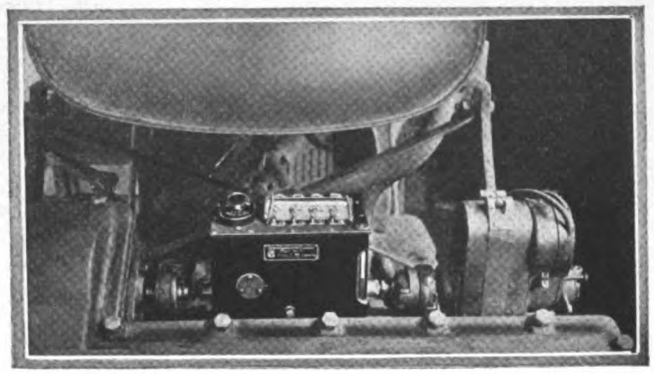
Digitized by Google



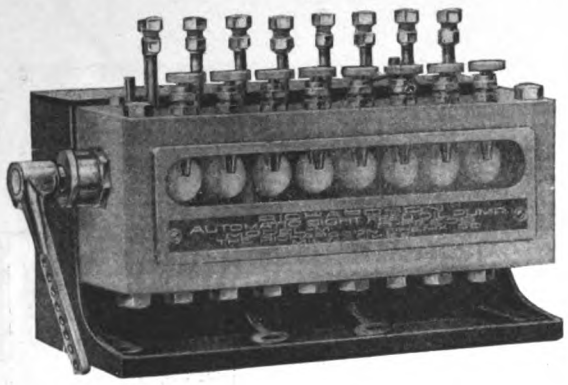
Plan view of a typical air compressor installation equipped for automatic lubrication, using both force feed and splash lubrication.



Ice Machine equipment with a single feed Force Feed Oiler installed.



A four-feed Force Feed Oiler with drive shaft extending through both ends, installed on an Aultman & Taylor Tractor.



At the left—Exterior view of a modern mechanical lubricator manifold, with sight feed equipment.

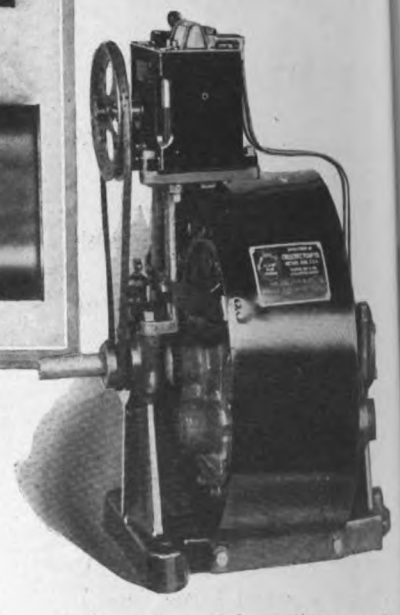
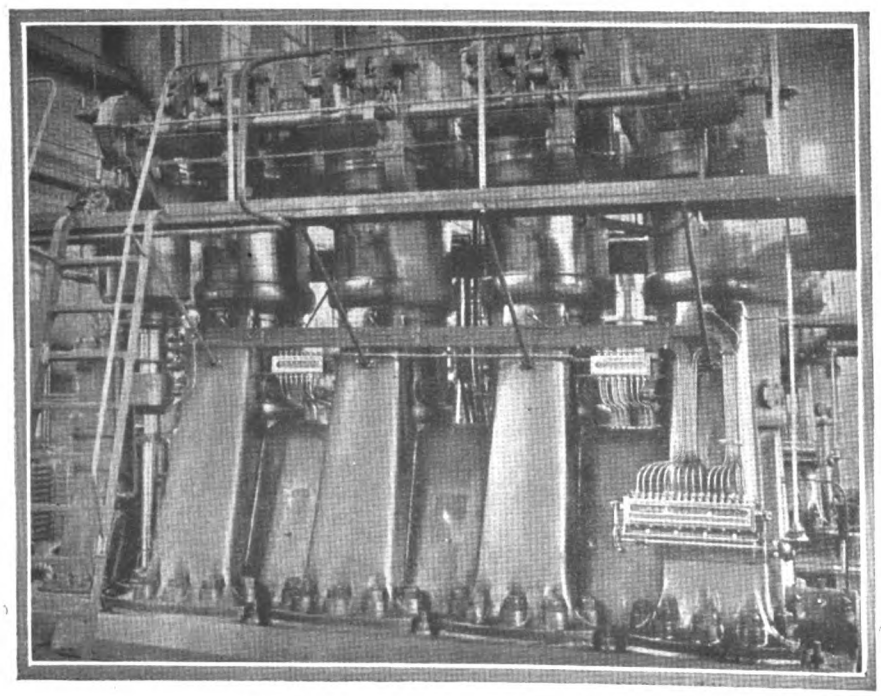


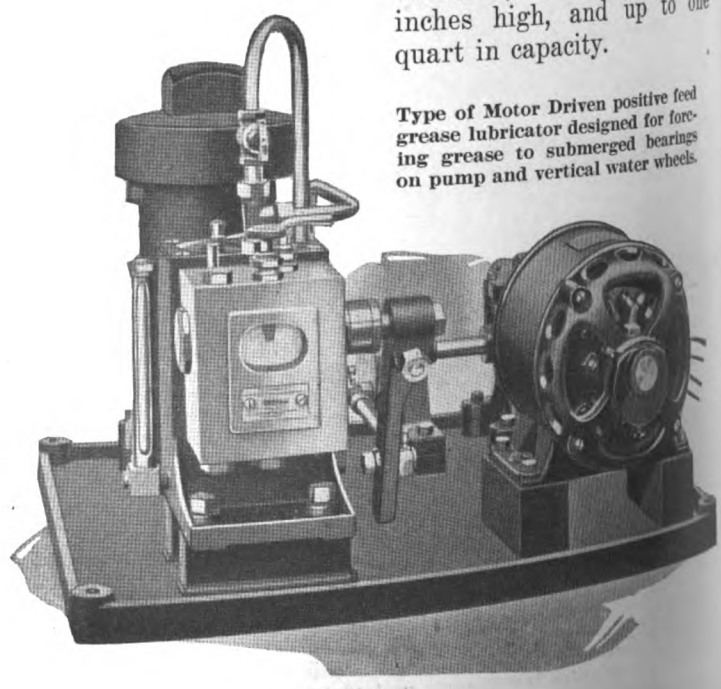
Illustration of a two feed type of Force Feed Lubricator installed on a Vacuum Pump.

the entry of dust, dirt or metallic particles which would score the bearings.

The development of the sight feed oil cup rapidly followed. This device was a vast improvement over the waste pad method of lubrication, and eliminated the necessity for almost constant attention by the oiler. As long as it was kept properly filled and cleaned, a uniform and economical supply of oil was insured, and the flow could be stopped whenever desired by simply dropping a lever attached to the top. Sight feed oil cups are today a most important piece of lubricating equipment and are extensively used in the smaller plant, and on all such bearings where equipment with a circulating oiling system would be too expensive. They are usually built from one to five inches in diameter, from two to ten inches high, and up to one quart in capacity.

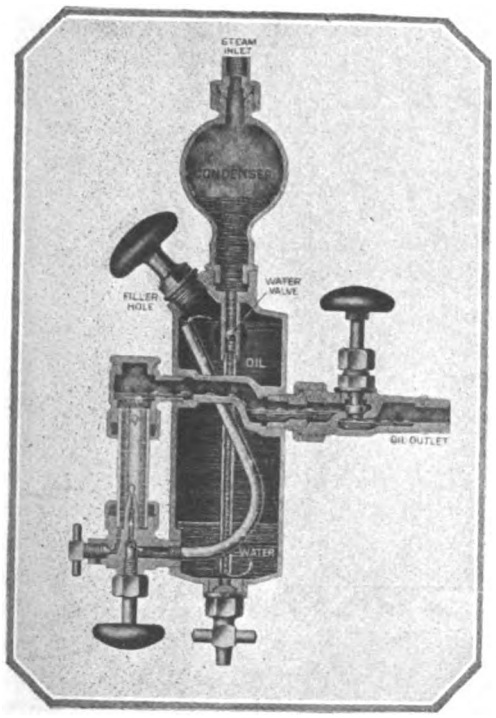


Sixteen-feed lubricator on a Diesel En[illegible] This engine is also equipped with R-P [illegible] feed Oilers.



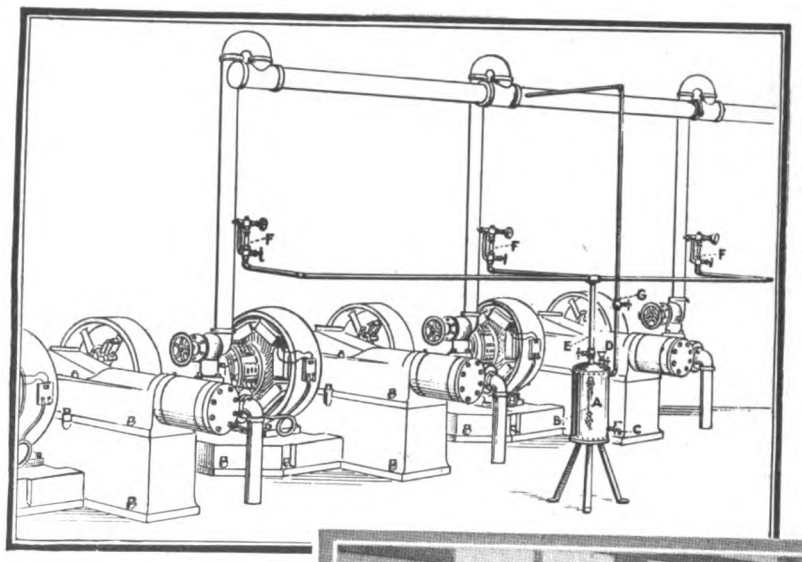
Type of Motor Driven positive feed grease lubricator designed for forcing grease to submerged bearings on pump and vertical water wheels.

Digitized by Google

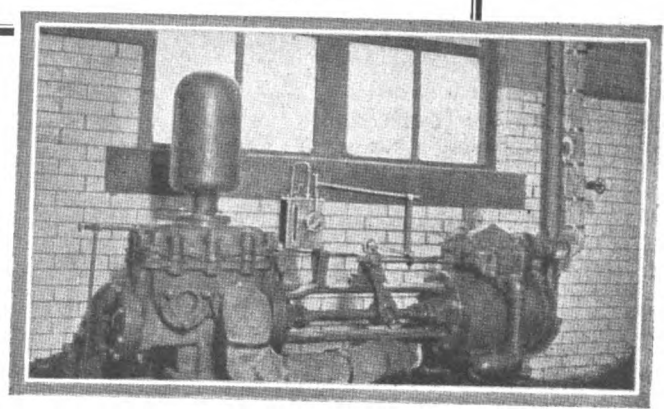


Sectional view of a hydrostatic lubricator showing the details of construction and the functions of the steam, water and oil. This lubricator operates by virtue of the body of water in the condenser "B" forcing the oil out of the oil reservoir into the steam pipe.

At the right—Illustration of a central tank, multiple feed cylinder lubricating system. Independent lubricators are shown at "F." The oil tank "B" is connected to oil and steam piping through valves "E" and "G" respectively.



Showing the manner in which mechanical force feed lubrication can be applied to steam cylinders of a steam pump, using a one quart Lubricator.

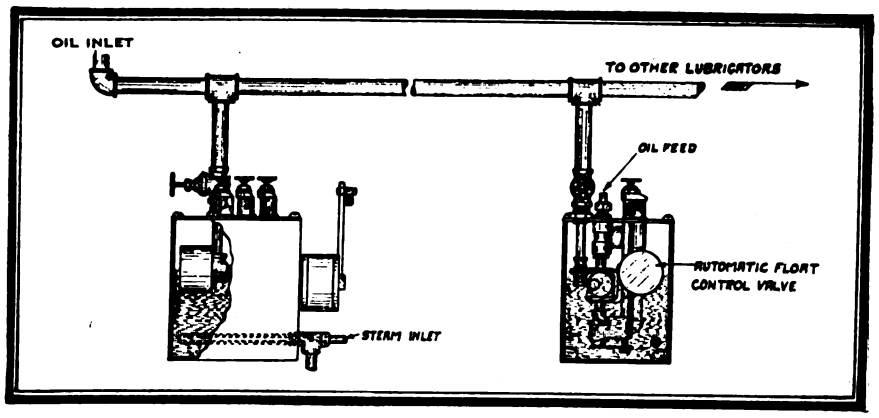


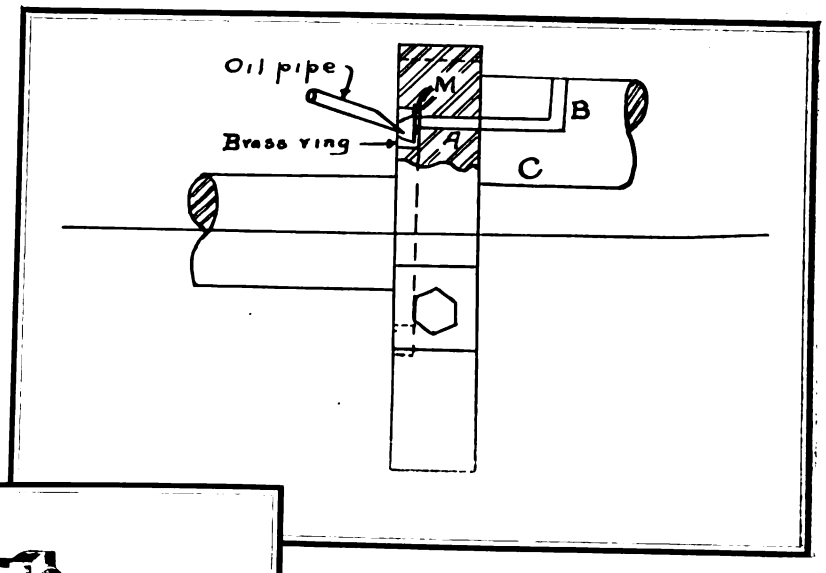
There are, however, many bearings in practically every installation where oil cups or circulating systems are not adaptable, owing to difficulty of access without stopping certain of the machinery, their natural location, and the need for a cheap installation. To overcome these difficulties the compression grease cup has come into usage. The great advantage of the latter is that it will furnish lubrication for an extended period of time without refilling, and requires only a periodic turn or two of the thumb screw to keep a thread of lubricant in contact with the bearing.

Owing to the fact that oil cups were found to require an appreciable amount of time and labor for filling, a large box

(*Continued on page 34*)

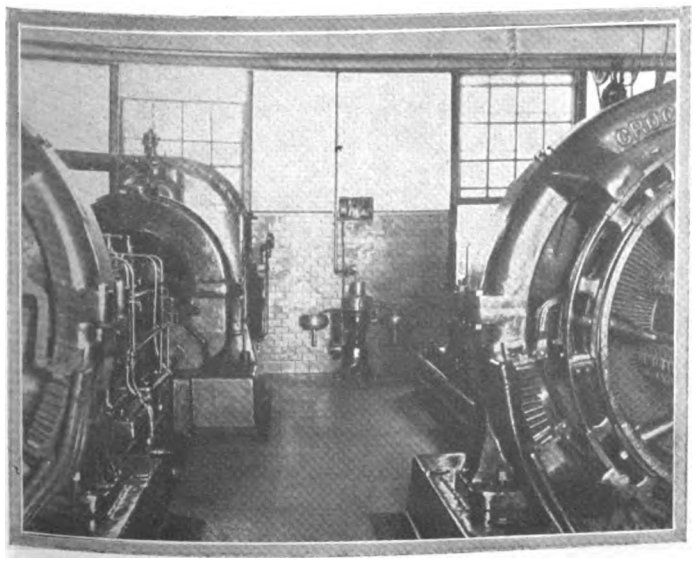
Sectional view of lubricators with inlet float control valves and heating connection, supplied from a central storage reservoir.





Centrifugal oiling device, in which a brass ring is securely embedded in the crank-shaft web. Oil is supplied through suitable piping. Centrifugal force causes oil to collect at outer edge of ring, building up a pressure proportional to the speed of shaft.

Below—Oil Purifier, of the same type as shown on page 22.



Digitized by Google

Managing the Move

Getting Into the New Quarters with Least Confusion

By W. H. Leffingwell

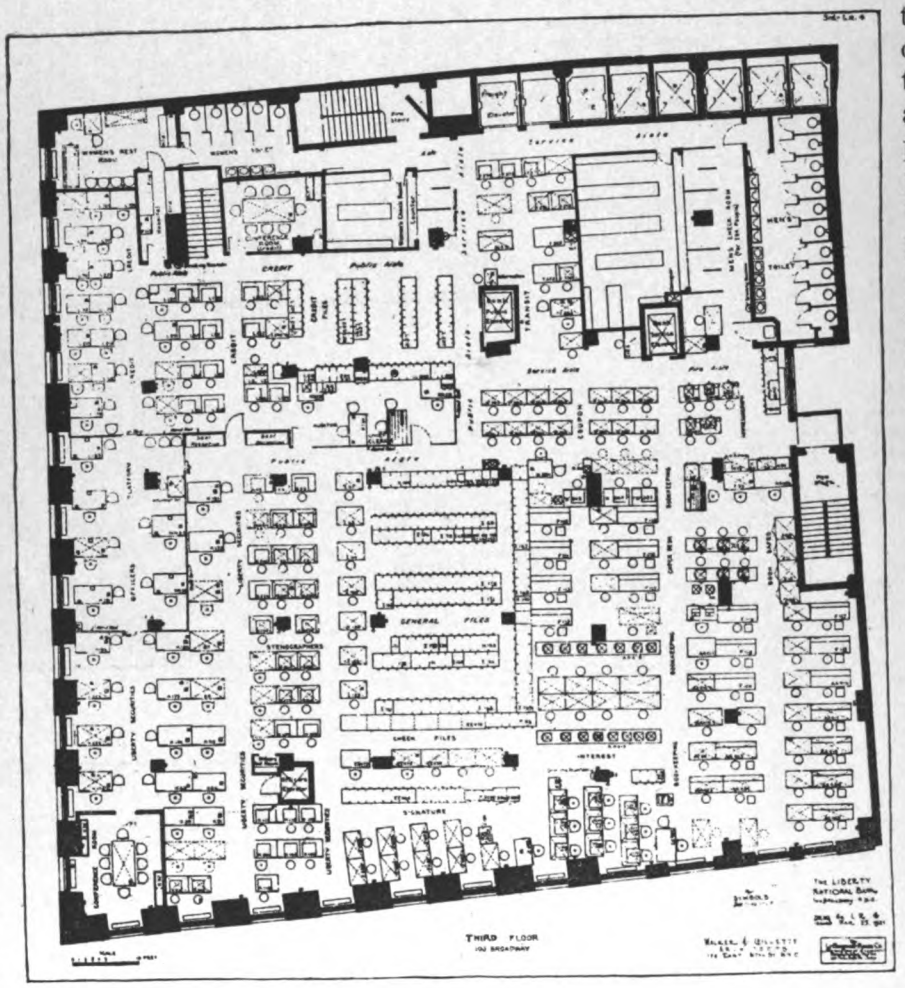
THREE moves are as bad as a fire, according to the old adage. It is pretty close to the literal truth too, judging by the usual experience of the American business house when it has to handle the problem of moving.

I witnessed an experience in Chicago recently. A large concern moved its general offices several blocks down the street to new quarters. In the process it lost several valuable papers. The wind blew them out of the drawers of desks, or they fell by the wayside; in any event, they were lost as completely as though fire had burned them. The move was made on Saturday so as to disturb business as little as possible, and by midnight everything had been transported to the new offices. But all next week the new offices were in a state of confusion, business was conducted under difficulties, and the greater part of the office force, instead of being occupied with their regular tasks, were busy shifting desks and files, getting the arrangement that suited the individual occupants, rearranging and sorting papers, and bringing some order out of the chaos —just the sort of thing that would be done after a fire.

But it is not necessary to do the thing this way. Some recent efforts have proved that the principles of scientific management can be applied to the problem of moving just as purposefully and successfully as they have been applied to the problem of production; and the move can be managed smoothly, without loss of time or property or interruption of business, and with an actual saving of expense.

A city bank was planning to move and asked a responsible moving company to quote a price for the job. The movers fixed their fee at $6,000. A hasty calculation showed that the number of pieces to be moved was six hundred, an average of $10 per piece. That seemed exorbitant, so we called on ten companies to bid, and finally a bid of $2,900 was received. Even that seemed too high, but in the absence of any scientific standards on moving we decided to accept it and time-study the job. The studies were made by elements. For example, the length of time to lift a desk; the number of people required to lift it; the length of time to carry it a certain number of feet to the elevator; the length of time required to place it on the elevator; and so on. Figures

(Continued on page 45)



In moving to new quarters, such a detailed layout as the above reduces the actual moving to a smooth-running, automatic process—everything going to its proper location without a hitch.



The original arrangement of stock floor of a wholesale house. Compare this with the illustration at the extreme right, showing how rearrangement was effected.

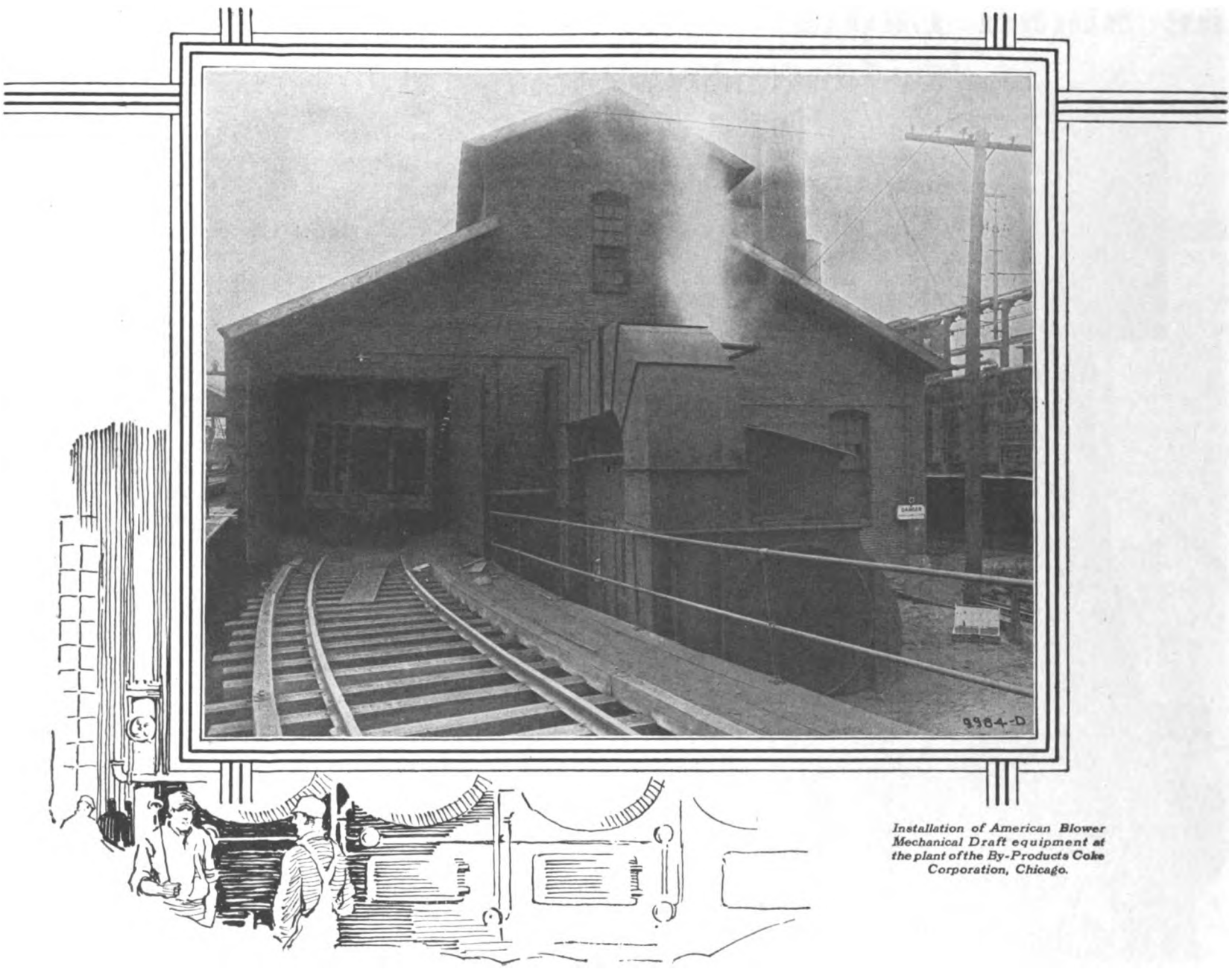
Below—In preparing to move, see all papers, etc. are tied in bundles; not left loose where they may be lost.





Same stock floor, as shown at the extreme left of this page, rearranged to facilitate the work and economize.

Digitized by Google



Installation of American Blower Mechanical Draft equipment at the plant of the By-Products Coke Corporation, Chicago.

American Blower Mechanical Draft Saves $88,200 a Year

A Letter From the By-Products Coke Corporation of Chicago

"When we added 2 units to our auxiliary boiler house, in 1911, we installed an American Blower forced draft system. This consists of 2 steam driven fans, one being used as a spare. At present, this equipment supplies air to 6-400 H. P. hand fired boilers, and because of the excellent draft we can burn fine coke brieze very satisfactorily.

To get the same capacity with natural draft, we would have to burn coal, which costs $3.50 a ton more than fine coke brieze. Therefore, the American Blower system saves $88,200 a year in fuel cost. It also saved the cost of the higher stacks which would probably have been required to create satisfactory natural draft.

We are also using 4 American Blower fans for handling hot gases from our coke ovens. This enables us to generate 1000 boiler horse power for every pair of fans.

The American Blower equipment was chosen because we were convinced that it would give good service. It has been very satisfactory and we have experienced no mechanical troubles. Under similar conditions we would repeat our orders.

The manufacturers furnish first class service, a highly important consideration in the choice of any equipment."

Bulletins describing American Blower equipment will be mailed upon request.

AMERICAN BLOWER COMPANY, DETROIT
BRANCHES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO (261)

American Blower

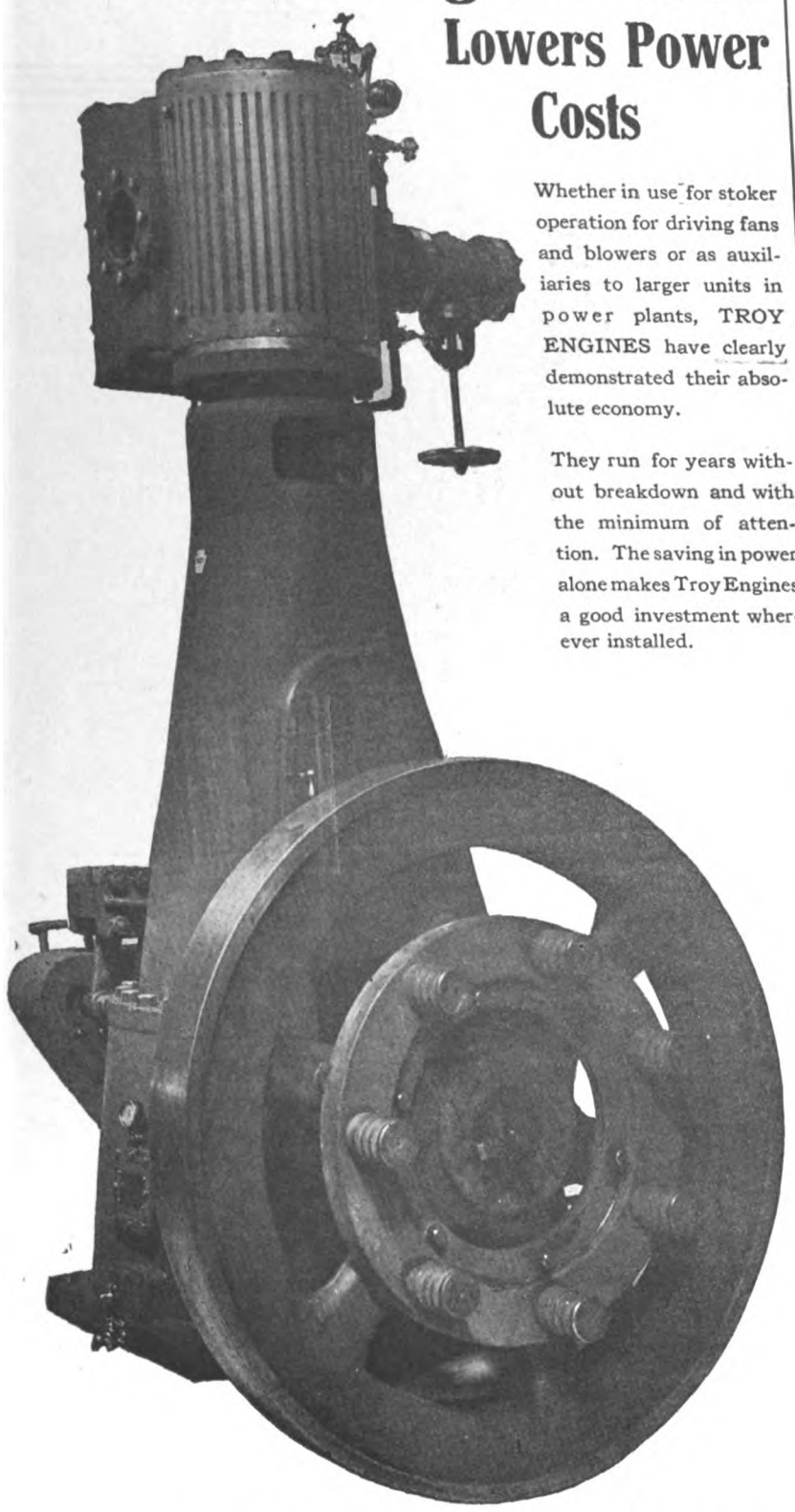
"Sirocco" TRADE MARK

EXHAUSTERS · VENTILATING FANS · AIR WASHERS · BLOWERS · ENGINES

FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

Digitized by Google

The Small Engine that Lowers Power Costs



Whether in use for stoker operation for driving fans and blowers or as auxiliaries to larger units in power plants, TROY ENGINES have clearly demonstrated their absolute economy.

They run for years without breakdown and with the minimum of attention. The saving in power alone makes Troy Engines a good investment wherever installed.

The Balanced Valve is an exclusive Troy feature. The cylinder is automatically cleared of condensation. The packing ring is steam-tight and remains steam tight even under extreme conditions.

Write for the Troy Catalog

TROY ENGINE & MACHINE CO.

TROY, PENNSYLVANIA

Built in sizes 2 to 200 B.H.P.

Vertical, Horizontal, Belted and Direct-Connected.

TROY ONLY STEAM ENGINES GOOD ENGINES ONLY ENGINES

The Preparation and Burning of Pulverized Coal

(*Continued from page 20*)

generation, have only emphasized and confirmed the success of those fearless pioneers in the Engineering field who dared to blaze the trail for powdered fuel: experimenting, designing, discarding, re-building, spending hundreds of sleepless nights and thousands of hopeful backers' dollars, improving and more nearly perfecting machines and equipment to fulfill the sub-title of this article "Cut the Coal Bill!"

The fine art of pulverizing coal is not new. It has been done for years, and there are "mills" of every description —roller mills, ball mills, tube mills, and ring-roller mills— each type with its adherents and antagonists, each performing its function, and each with its own little brood of troubles —successfully reducing lump coal to powder. No engineer denies that coal can be pulverized, and that, *practically;* but the discussion starts with the system of distribution, or method of application. There are two methods of application: *direct,* with pulverizing equipment located immediately adjacent to the point of consumption; and *indirect,* with all pulverizing equipment grouped in a central station or plant, distributing the prepared fuel to various points of consumption— the latter sometimes scattered in several directions, and located hundreds of feet apart. For the indirect method of firing, there are three systems of Distribution: (1) mechanical conveyors, usually of the "screw" type, (2) high-pressure air, and (3) volume air at low pressure. Summarily, screw conveyors are costly to install, and more costly to maintain and operate. High-pressure air is costly, both from the standpoint of first cost and operation. Volume air at low pressure requires more power to operate, but has low first cost and low maintenance. This article holds no brief for any method or system —the fact stands undenied, that each and all are *cutting the coal bill,* but the one that cuts the deepest is the method and system which (regardless of first cost) will effect the greatest general efficiency throughout the plant wherein it is installed, at lowest cost spread over an operating period of five or ten years.

Having reached the conclusion that bituminous coal can be practically pulverized and distributed to various points of consumption, by one of the several systems now in general use, our thought naturally turns to the adaptability of pulverized fuel for firing, seeking to find the largest consumers, and, from the standpoint of national economics, to ascertain where the greatest savings can be effected. Assuming the amount of coal mined in the United States in one year to be an average of 600,000,000 tons, we find:

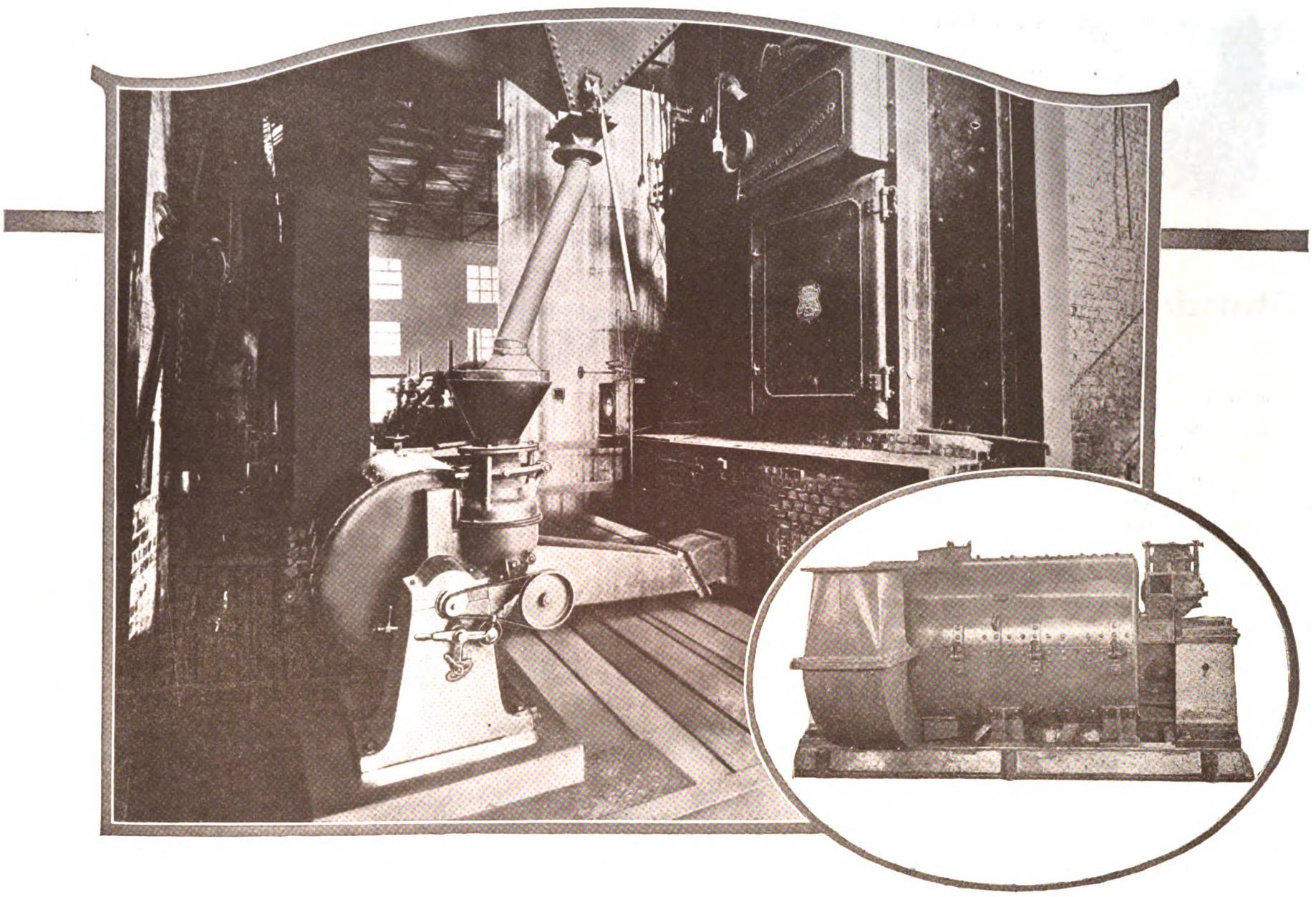
(1) 75,000,000 tons used for producing coke
(2) 100,000,000 tons used in domestic establishments
(3) 100,000,000 tons used by ships or exported
(4) 150,000,000 tons used by railroads
(5) 175,000,000 tons used in power plants, large and small.

Passing, for the moment, items 1, 2 and 3, we find the largest consumers in commerce and industry, to be the railroads and power plants. The loss and waste in the former—the backbone of our National Industry—is enormous, and pages could well be devoted to the possible economies there, but space will not permit the review of progress made in pulverized fuel firing under locomotive boilers. Suffice it to say, in passing, that actual accomplishments along this line have progressed beyond the experimental stage, a number of prominent Trunk Lines have locomotives thus equipped in practical operation, and indications point to the ultimate general use. The exceptions will be those roads whose lines operate through established oil fields, where fuel-oil becomes the logical and economical answer to the locomotive-firing question.

Thus, by elimination, the problem remaining for particular consideration in this article, is "cutting the coal bill" for the 175,000,000 tons consumed industrially in the

(*Continued on page 30*)

Digitized by Google



A Compact Powdered Coal Equipment

The Aero Unit System Delivers Coal in Powdered Form Direct to Furnace Under Precise Control—

"Greater Efficiency, Mechanical Simplicity and Ease of Control justify the change that has been made in the plant by substituting pulverizing coal equipment for stoker equipment;" writes an engineer in his report of a test on the Aero Unit System of Powdered Coal.

The installation demonstrates how an original idea of simplified equipment is finally perfected to meet the most exacting requirements and insure thoroughly dependable operation.

The Aero Unit receives the raw coal from the bunker, without preliminary drying, and exhausts it in the powdered form direct to the furnace. There is no storage of the pulverized coal. Control of coal and air is positive and can be instantly regulated to meet the varying conditions.

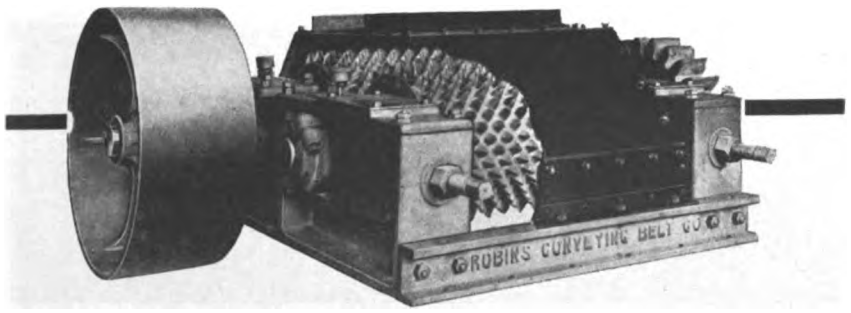
The heavy steel construction has been developed on the basis of long experience to meet the contingencies in service.

Send for Bulletin No. 28.

Aero Pulverizer Company,
165 Broadway, New York.

AERO UNIT SYSTEM

Digitized by Google



Robins Standard Two-Roll Crushers

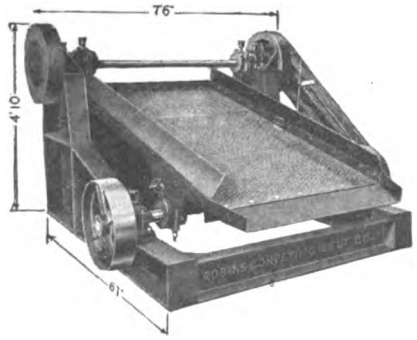
Massively constructed, with interchangeable parts that are "get-at-able," appeal to the practical man familiar with the trouble and expense of ordinary crushers.

The rolls are composed of chilled cast iron toothed segments for coal and fluted segments for coke, attached to roll hubs by steel bolts. The bearings are heavily babbitted, split on 45 degrees thus placing the thrust directly on the center rather than on the edges.

The rear bearings rest against a standard railway draw-bar spring to allow of the roll giving way in case any foreign substance finds its way into the crusher.

Robins Coal Preparation Equipment

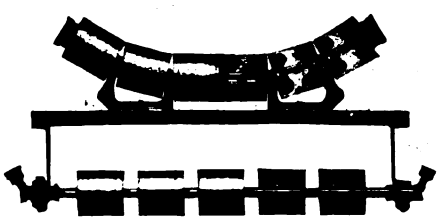
Belt Conveyors fixed and Portable, Belt and Bucket Elevators, Rotary Grizzly Screens, Bin Gates in all types, Feeders.



"GRASSHOPPER" SHAKING SCREEN for coal and coke. Capacity up to 150 tons per hour with 5 H. P. motor. This screen will give three sizes when furnished with a double deck. Over 100 in successful operation.

Our Engineering Department

is ready to co-operate with you in the design of coal preparation equipment for Power Plants, Gas Works, By-Product Plants and Industrial Power Plants.



Robins Standard 5-Pulley Idlers

in all sizes from 12 in. to 60 inches. All pulleys in same vertical plane. Friction and roller bearing types with grease cups or "Alemite" fittings.

ROBINS CONVEYING BELT CO.

Park Row Bldg., New York

Chicago **Boston** **Pittsburgh**

Robins Conveying Belt Co., Park Row Bldg., New York

Please send information describing Robins Coal Preparation Machinery and other ROBINS PRODUCTS.

Name..... Position....

Company .....

Address .....

(*Continued from page 28*)

United States each year. If any doubt remains, in the mind of the reader, about the trend of the times (as far as pulverized coal firing is concerned), let him reflect on the following noteworthy installations which have been operating with unqualified success, from two to six years. The last named is now in course of construction. Ford Motor Co., River Rouge, Detroit; Milwaukee Electric Railway & Light Co., Oneida Street and Lakeside stations; Bethlehem Steel Co., Lebanon, Pa.; M. K. & T. R. R. Co., Parsons, Kansas; Puget Sound Traction Light & Power Co., Seattle, Wash.; United Verde Extension Mines, Arizona; Nevada Consolidated Copper Co.; M. A. Hanna & Co., Lytle, Pa.; General Electric Co., Schenectady, N. Y.; Carnegie Steel Co., Homestead, Pa.; British Columbia Sugar Refining Co., Vancouver, BC. or the new 350,000 KW station of the Union Electric Light & Power Co., St. Louis, Mo. Cahokia Power House.

We must conclude then that pulverized coal firing has proved, beyond the peradventure of a doubt, its efficiency and economy in the *large* central station. But, numerically, these stations are in the overwhelmed minority, and therefore cannot be considered as extravagant wasters of fuel. The small, inefficient, and comparatively high-cost plants, scattered throughout the country, are decidedly in the majority, and should receive our attention. Strangely enough the general impression seems to be that pulverized firing is not practical in plants developing less than 2000 hp. As a matter of fact, this impression is far from a correct and logical one, for it is among these so-called "isolated" plants that will be found the *greatest* need for immediate and permanent economies. The average boiler plant, under 2000 hp normal rating, requires an average of 7 pounds of coal per hp hour, and the cost of coal, plus labor for firing and disposal of ashes, comprise 80 per cent of the total cost of $120 per hp. year. The use of pulverized coal will cut these costs in two. Operators of small plants should know they do not need

(*Continued on page 33*)

Let Us Make It For You



A few examples of pressed steel stampings which we have made for prominent companies

YOU will find our equipment for making pressed steel stampings unsurpassed in completeness. We have presses and machines of all kinds, capable of very heavy pressed steel plate work as well as the lighter sheet metal stampings. Our facilities for electric welding are unusually large, including best modern methods. We have complete machine shops for making dies, tools, etc.

Among our products are Truscon Alloy Steel Platforms and Boxes, Conveyor Parts, Truscon Alloy Steel Flasks, Bottom Boards, Core Plates, Core Racks, Gaggers, Ladles, etc., etc. Truscon Alloy Steel Products for foundries and for handling material are sturdy, durable and economical.

Truscon Service Yours Without Obligation

Our engineering force is always at your disposal. In designing your steel parts its advice and co-operation can save you money or give you a better product. The long experience of the Truscon organization will also be of value to you in improving your products by using pressed steel in place of other materials.

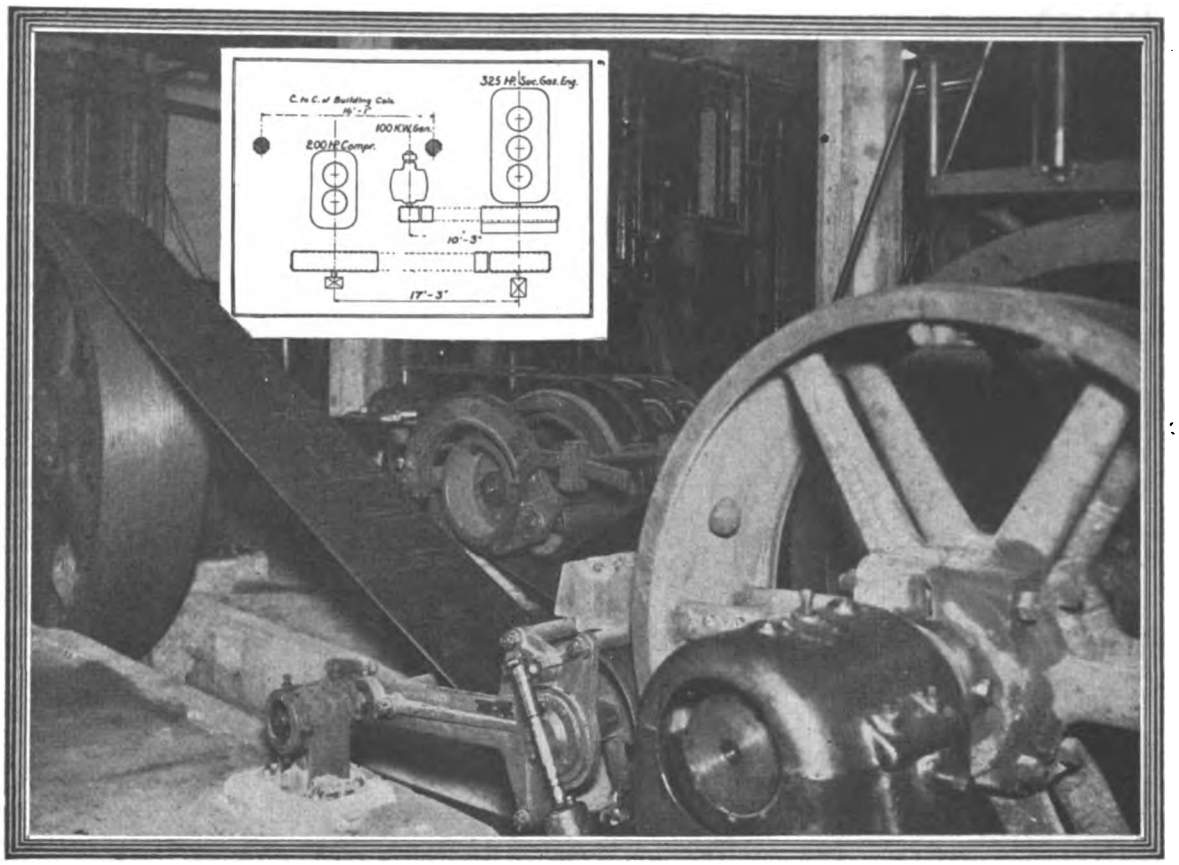
Write for literature and quotations

TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO

Warehouses and sales offices in principal cities

TRUSCON ALLOY STEEL PLATFORMS

Digitized by Google



Another Example of the Advantages of The LENIX DRIVE

The LENIX Drive has solved the problem of this company of co-ordinating a compressor and a 100 KW generator with a 325 HP suction gas engine. The centers are 17′ and 10′ respectively. Thirty feet centers would be required with ordinary open belt drives. Three of such combination units, as illustrated, are installed and operating.

In addition, in the same plant, there is one LENIX on a 400 HP suction gas engine driven compressor and one LENIX on a 60 HP motor driven compressor.

The special design of these LENIXES automatically adjusts itself to all the irregularities in starting the suction gas engines.

The varying power requirements of the compressor and generator may cause one belt to stretch more than the other. The LENIX compensates for the uneven stretch of the belts by automatically taking up the slack and utilizing it to increase the arc of contact between the belt and pulleys, thereby bringing into working contact the hitherto unused surfaces of the belt and pulleys.

Wherever belts are used in power transmission, the LENIX will improve your drive

Booklet "Saving Slippage and Space" describes the LENIX. A copy will be sent on request.

Five Points

1—The Lenix increases the arc of contact between belt and pulley.

2—The Lenix maintains, constantly and accurately the proper tension in the slack side of the belt.

3—The Lenix saves floor space, building space and belting because of freedom in pulley locations.

4—The Lenix saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The Lenix permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

F. L. SMIDTH & COMPANY

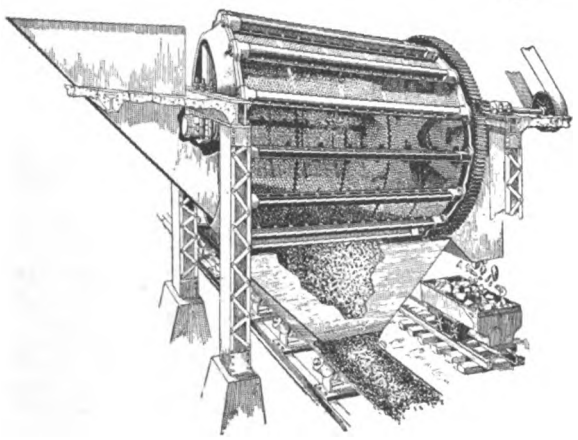
ENGINEERS

50 Church Street, New York, N. Y.

The LENIX DRIVE

Digitized by Google

Preparing R. O. M. Coal *for* Pulverizing



"Pennsylvania" Bradford Coal Breaker and Cleaner

The "Pennsylvania" Bradford Breaker prepares R. O. M. Bituminous Coal for Stokers, Gas Making, Washing, Coking and for Pulverization.

The crushing is done by the simplest and most elemental method of raising and dropping the coal repeatedly. During the course of this process the good coal breaks and passes the screen plate perforations with minimum fines, and accurately sized for the particular purpose for which it is being prepared, while the harder refuse including slate, bone, sulphur balls, Tramp Iron, wood, binder and stone is automatically ejected, as shown in the cut below.

"Pennsylvania" Coal Preparation Machinery also includes Steel-built Hammer Crushers for finer reductions, and Single Roll Crushers for smaller installations.

All of this equipment is arranged either to eliminate the Tramp Iron, or to operate without damage and breakdowns from Tramp Iron.



The resulting product is accurately prepared for pulverization either directly following the crushing operation or after drying.

A "Pennsylvania" Bradford Breaker is included in the equipment of the largest Central Station designed for operating on pulverized fuel, and will prepare 300 tons of Bituminous Coal hourly in this service.

The automatic elimination of Tramp Iron protects the pulverizing equipment, preventing costly breakdowns and delays.

We have brought the right solution to many coal preparation problems, and are ready to cooperate on receipt of your suggestion.

Send for Bulletin 6001

PENNSYLVANIA CRUSHER COMPANY

General Offices
1320-1325 Stephen Girard Bldg.
PHILADELPHIA, PA.

Branch Offices and Agencies in principal cities

Cable address: *PENNCRUSH, PHILA.*

Every Power Plant Chief Wants His Men Protected

The best equipped plants have the best efficiencies.

Not one would let the cost of a safeguard stand in the way where the safety of the men in the plant is concerned. And yet in many instances safeguards are installed too late—after an accident occurs.

ACT NOW

You will be safeguarded against boiler explosion due to low water if you use Vigilant Regulators.

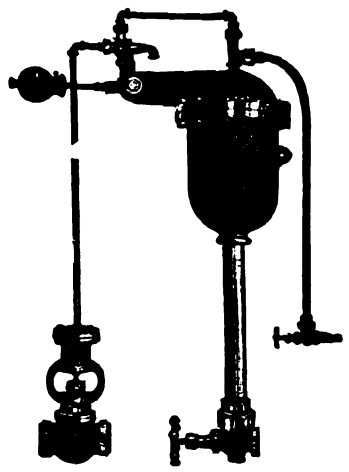
They cannot fail to operate and keep the water level where it will enable the boiler to produce the driest steam at the highest economy figures.

The slow uniform feeding of these Vigilant Regulators means fuel economy because the feed water is then heated uniformly to a higher degree. Their operation depends on gravity—always positive. No expansion tubes to buckle or to get out of line. No diaphragms to crack. No floats to fail. You can actually see it work. The movement of the outside weighted levers gives evidence of its operation.

Get our engineers' recommendation. No obligation.

Write for the catalog today

VIGILANT Feed Water Regulator



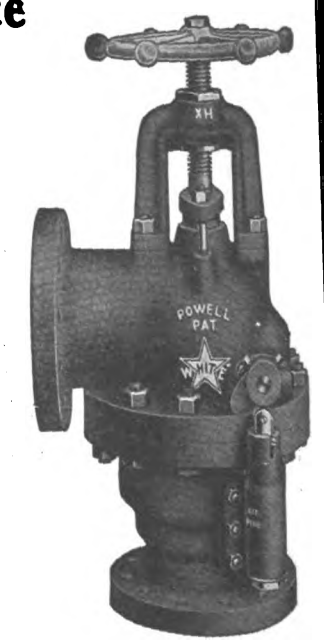
The Chaplin Fulton Mfg. Co.

28-36 Penn Avenue
Pittsburgh Penna.

POWELL VALVES

Backed by 75 Years Experience

Fig. 2228



Powell Triple Acting Valves automatically close when a tube bursts —isolating the boiler.

POWELL WHITE STAR VALVES

are a combination of the most serviceable mechanical factors insuring to the user unfailing dependability.

Two reasons for their long life are their regrindable, renewable disc, both cast of Non-Corrosive Powellium Nickel.

Medium and extra heavy for steam working pressure up to 200 and 300 pounds.

SEND FOR DESCRIPTIVE CIRCULAR

The Wm. Powell Co.

2525 SPRING GROVE AVENUE CINCINNATI, OHIO

Digitized by Google

(*Continued from page 30*)

to buy a Packard, when the price of a Ford, only, stands between them and efficient economy.

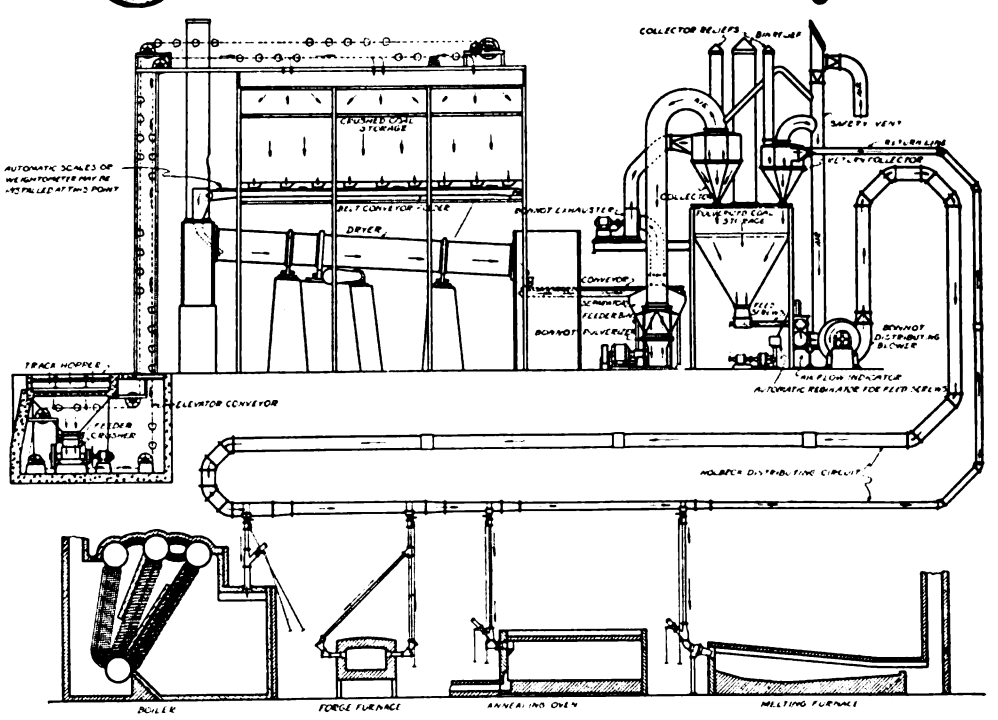
There have been several popular reasons (or alibis!) for the unpopularity of pulverized coal in those smaller plants. The first cost "bug-a-boo" has loomed over the horizon in numerous instances, but a careful investigation will prove this a myth of chimerical nature—dissolved into blue air—you will find that economies in the smaller stations are not only possible *but can be proven.* Do not be frightened by the seemingly prohibitive costs of fuel installations in large central stations. Modern methods, and progress made by engineers who are specialists in combustion and preparation of fuels for combustion, have developed mechanical equipment for all conditions—the small consumer may now obtain apparatus suitable for his needs, at a first-cost ridiculously low when compared with the savings effected. Some manufacturers even go so far as to *guarantee* certain savings, basing their assurances upon actual costs, of record prior to the adoption of pulverized firing to supersede hand-fired or mechanical stoker operations. Therefore, the element of chance has been practically eliminated for the prospective investor in or user of pulverized fuel, either in the power-house boiler, or in the furnace of the metallurgical industry.

Another goblin of fright has been proven imaginary also—the fear of explosions when handling pulverized fuel. The use of the descriptive adjective "powdered" in conjunction with "fuel" should be discontinued as a misnomer, lest the suspicious and doubting ones fail to rid themselves of the idea that "pulverized coal" is synonymous with "gunpowder." Truly enough, accidents *have* happened in plants where pulverized coal was burned—but have there not been boiler explosions, gas explosions, and oil explosions? Happily, these are rare occurrences nowadays, having become so through the efforts of the Federal Bureau of Mines, whose investigations have resulted in the broadcasting of invaluable *"don'ts"* and *"do's"* across the widespread fields of industry. Pulverized coal can be and *is being* burned with no more diastrous results than from the use of steam, gas, or fuel oil. Carefully kept records of the largest industrial corporations in the United States are the authority for this statement.

The illustrations which accompany this article, show clearly the details of equipment in typical pulverized coal installations, and are impressive in that they show conclusively, the wide range of apparatus. Scarcely a branch of the industrial tree, but can be reached by pulverized fuel, with equipment that "cuts the coal bill."

Coal has been called "Black Diamonds" but in Anno Domini, 1923, there is more truth than jest in the appellation. Diamonds are precious because they are admittedly a luxury, to be purchased only by men of means; they are luxurious because they are expensive, to be owned by Queens; one of the governing reasons why they are expensive, is because only a small proportion is actually recovered and used, in the process of making them valuable.

PULVERIZED COAL EQUIPMENT



Diagrammatic Arrangement of The HOLBECK PULVERIZED COAL SYSTEM showing adaptability to Boiler, Heating Furnace, Annealing Oven or Melting Furnace

We design, build and install, complete coal handling and pulverizing systems, from railroad car or coal barge to boiler, furnace or oven. We have equipped some of the most noteworthy plants in the United States and abroad—our Engineers will study your problems, submit designs and estimates, without obligation on your part. On our reputation, we solicit your inquiries.

The Bonnot Company

Canton, Ohio.

Digitized by Google

Automatic Lubrication

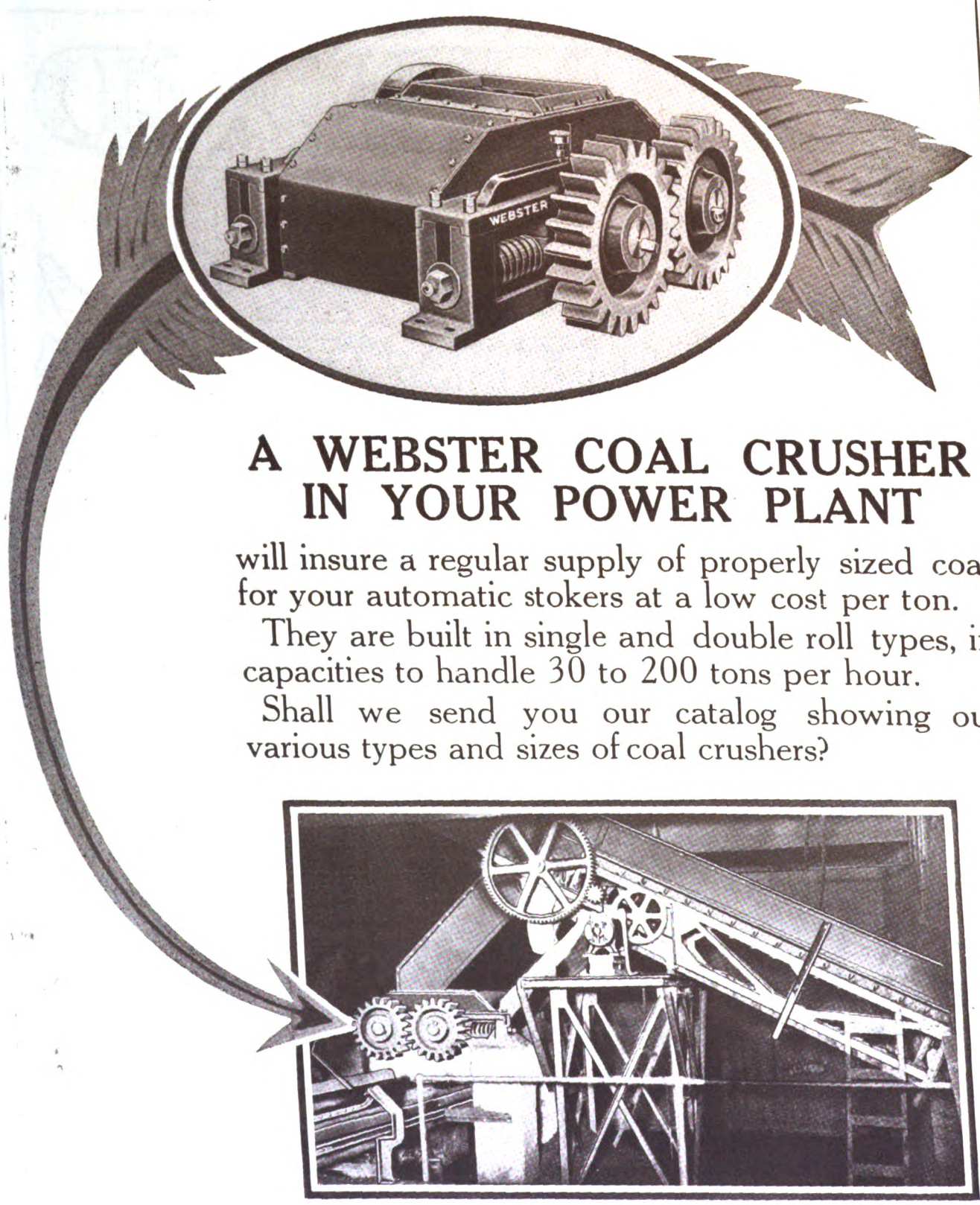
(*Continued from page 25*)

or manifold, of several gallons capacity, was introduced as a central source of oil supply for the system. As installed today, such a manifold is located upon the machine to be lubricated, being set slightly higher than the topmost bearing served. The bottom of this manifold is equipped with suitable valves and sight feed connections to the piping which leads to the various bearings. Thus, the oil supply to each can be regulated or cut off independently from the others. The great advantages of such equipment are: The viscosity of the oil is relatively little affected by temperature changes; filling, cleaning and adjustment can be carried out far more rapidly than were individual oil cups used; and oil pipes can be lead to bearings which would be practically impossible for the operator to reach without shutting down the machine.

With the necessity for the re-use of lubricating oils becoming a paramount factor in power plant operation, ring and chain oiled bearings soon came into development. Today this construction is extensively prevalent on all types of high grade equipment such as motors, centrifugal pumps, etc. In basic form the ring or chain oiled bearing is separated into two parts by a slot in which revolves a metal ring or chain which is hung on the shaft. The bottom of the bearing box is cast with an oil reservoir into which the ring or chain is suspended. Thus, with the revolution of the shaft the ring or chain is given a certain amount of rotation to carry the oil to the top of the bearing from whence it flows into the clearance space or oil groove. It is thus distributed to the entire surface of the shaft and bearing, to flow therefrom back to the oil reservoir.

Lubrication by means of ring or chain oilers is the simplest form of what is looked upon today as the most efficient method of oiling, *i. e.*, to flood the bearings with a large excess of oil over the quantity that would normally be absolutely necessary for proper lubrication. Thus the oil not only serves to lubricate, but as well, it acts as a cooling medium and reduces the operating temperature by carrying away a certain amount of frictional heat which is ultimately radiated to the air from the exterior surface of the oil reservoir. For this reason the latter should have quite a large capacity. Another advantage of this method of continuous oiling is, that the flood of lubricant tends to wash the bearing surfaces clear of metallic particles, dust and dirt, and consequently wear is reduced to a minimum. Due to this washing action the oil in the reservoir will gradually become impure. For this reason ring and chain oiling systems should be flushed out and cleaned periodically, and refilled with new or purified oil, otherwise

(*Continued on page 38*)



A WEBSTER COAL CRUSHER IN YOUR POWER PLANT

will insure a regular supply of properly sized coal for your automatic stokers at a low cost per ton.

They are built in single and double roll types, in capacities to handle 30 to 200 tons per hour.

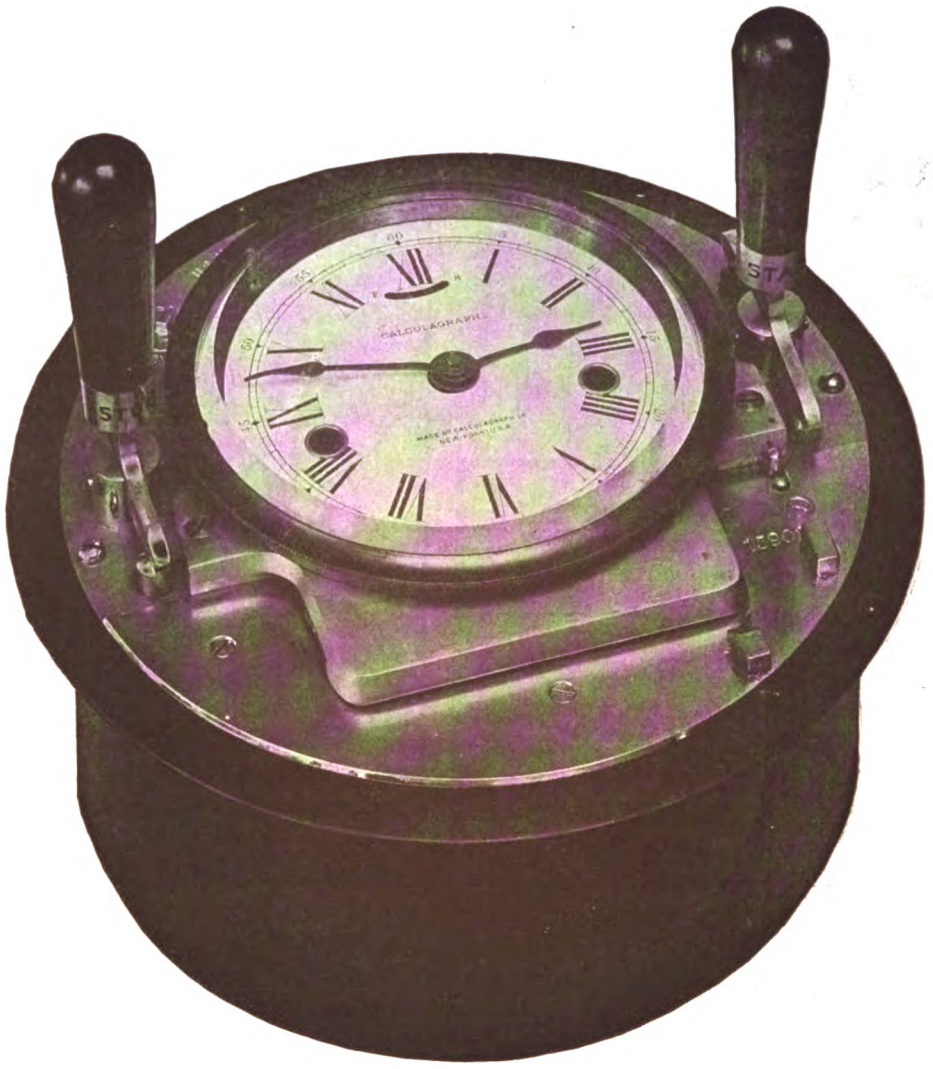
Shall we send you our catalog showing our various types and sizes of coal crushers?

THE WEBSTER MFG. COMPANY

4500-4560 CORTLAND ST., CHICAGO

Factories Tiffin, O. *and* Chicago-Sales Offices *in* Principal Cities

Digitized by Google



Install the spring-driven Calculagraph—
elapsed time recorder

The great advantage of a Calculagraph installation is the mechanical computation of *elapsed time*. It prints on the job ticket not only starting and stopping but *elapsed* time.

Each Calculagraph is a separate unit. Any number of men can use one Calculagraph, but if you have several departments, or different floors, as many can be installed as desired.

Not only are mechanical difficulties avoided but human errors lessened. The time of cost clerks is saved. They no longer need to subtract starting from stopping time. The *elapsed time* can be read direct from the job ticket.

Send for our booklet "Elapsed Time Records." It will interest you.

THE

CALCULAGRAPH

THE ELAPSED TIME RECORDER

34 Church Street, **New York City**

Digitized by Google



ARE YOU USING YOUR FLOOR SPACE TO THE BEST ADVANTAGE?

Floor space is valuable. Are you getting full returns for the amount yours costs you? Globe-Wernicke Counter Height Filing Cabinets will enable you to economize on space and at the same time have a most efficient filing system.

Counter Heights being of uniform height and depth are often used instead of a fence to form a reception room or to separate various departments in an office. Each one is a complete unit in itself and has its own sized linoleum top.

Obtainable with any filing device desired.

Write for Descriptive Booklet Illustrating Uses.

"Globe-Wernicke Counter Height Filing Cabinets."

The Globe-Wernicke Co.

DEPT: I: I: 84 CINCINNATI
Chicago

Detroit
St. Louis
New York
Philadelphia

Boston
Cleveland
Washington
New Orleans

Globe-Wernicke

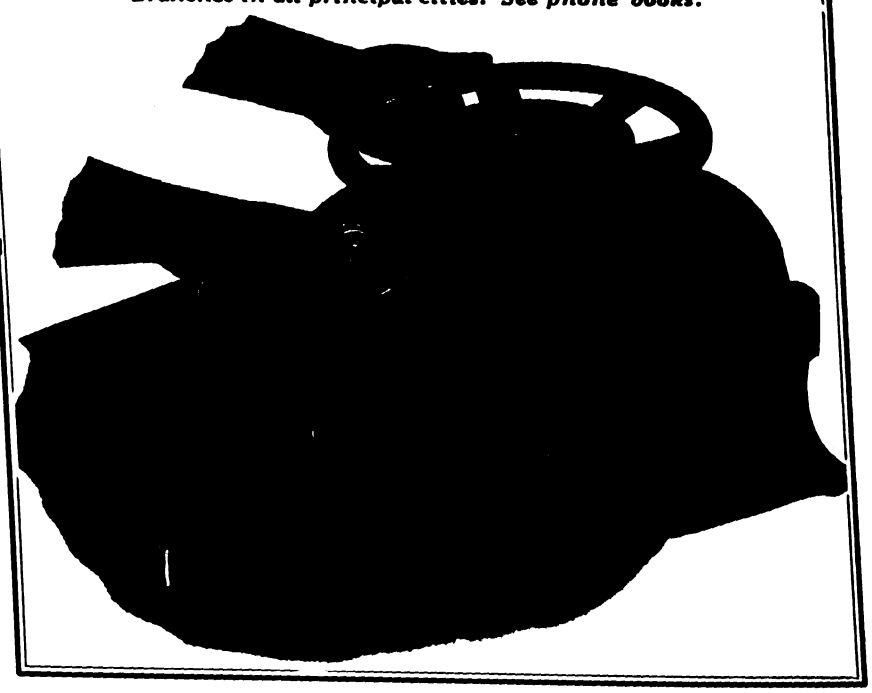
BUILT TO ENDURE

DIAGRAPH YOUR SHIPMENTS

The Diagraph cuts legible address stencils for marking all packages, boxes, bags, cans, crates, castings and similar material. Addresses do not blur, wash or rub off. Safer than tags. A practical insurance against lost and delayed shipments.

Try one free in your own shipping room—price complete with all supplies, only $110.00 delivered, in either housed or open models. Order one on trial—no obligation to buy—we pay all charges.

DIAGRAPH STENCIL MACHINE CORPORATION
1625 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities. See phone books.



Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width	$10.68
9½ " "	11.93
11½ " "	14.00
12¼ " "	15.45
13 " "	16.00
14 " "	17.59
15 " "	18.84
18 " "	22.00
18¼ " "	22.90
24¼ " "	30.45

F. O. B. ROCHESTER, N. Y.

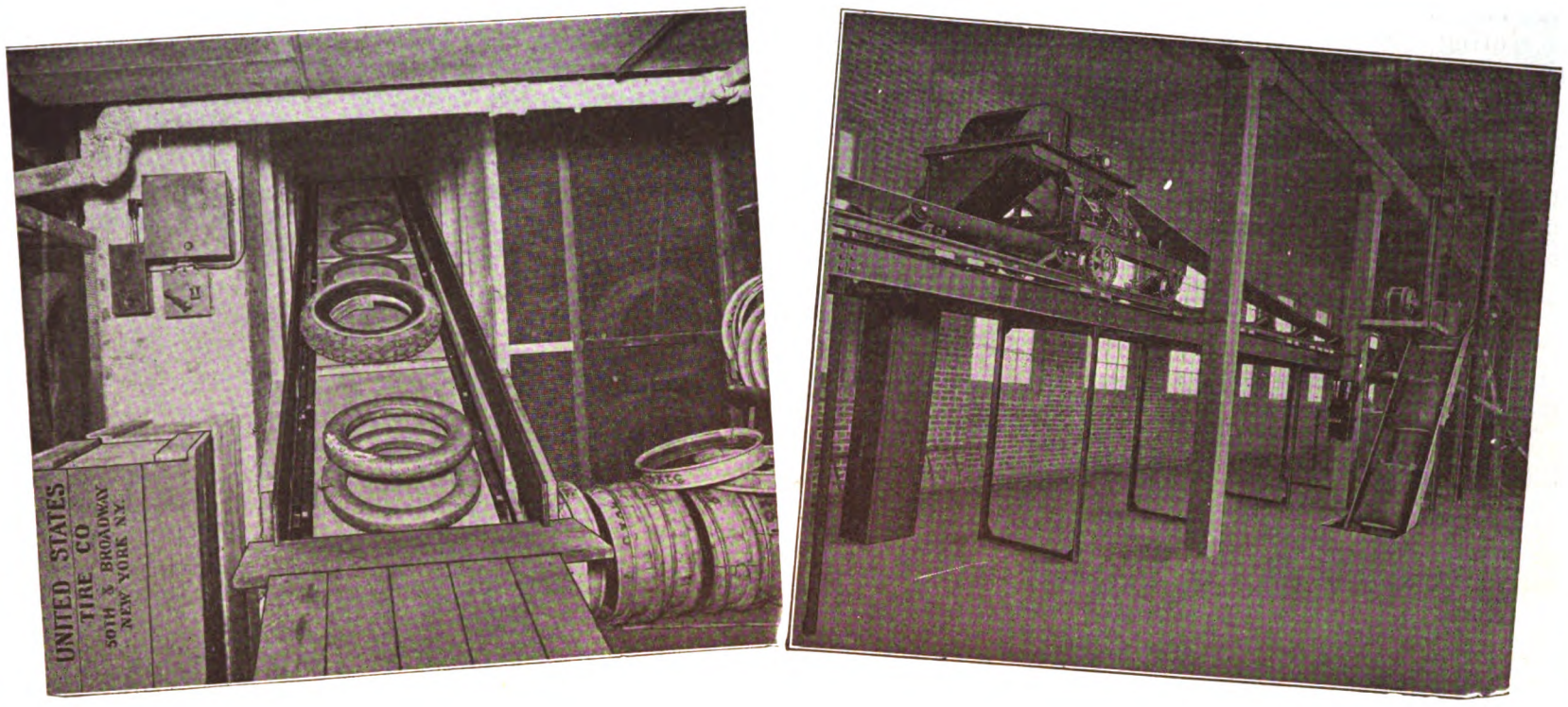
Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. ***Our Customers will benefit.***

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company
(*An Independent Corporation*)
ROCHESTER, N. Y.

Digitized by Google



How does your present production compare with that of a year or six months ago?

If your production remains about the same it is very likely that you are dis-satisfied with the status of your business. If this is the situation production should be increased because genuine prosperity is the result of maximum production—smaller unit profits and increased sales.

A Conveying System not only increases production but it is the means of controlling it. Your present equipment plus a Conveying System designed to meet your individual conditions will yield a production far in excess of that which you are producing at present.

Conveying Systems to function properly must be designed to meet specific requirements. This requires making a survey of your plant, studying your operations, determining desired production so that data can be secured which will enable us to design a conveying system which will enhance your production.

Adequate production will make your business prosperous. Lose no time. Communicate with us at once. Write us immediately advising time convenient to confer with our engineers.

SAMUEL OLSON & CO.

Loose, Bulk and Packed MATERIAL HANDLING SYSTEMS

2414 Bloomingdale Ave.
CHICAGO, ILLINOIS

202 5th Ave.
NEW YORK, N. Y.

Digitized by Google

(Continued from page 34)

the excessive accumulation of foreign matter will be liable to cause scoring of the shaft and bearing metal.

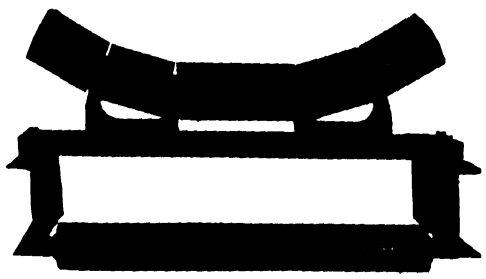
It is seen that flood lubrication is, therefore, directly opposite to the old theory of supplying wearing parts with just enough oil to properly lubricate them, or, in other words, the theory of drip cup and hand lubrication. Flood lubrication is admirably efficient but it should never be carried to a maximum unless the oil reservoir is of ample size to allow sufficient time for the oil to be properly cooled and cleaned. Otherwise there will be a marked tendency towards emulsification, oxidation and vaporization.

Of the force feed system in use today, the gravity feed idea is perhaps the simplest in construction. Essentially it is much similiar to the manifold principle of drip feed lubrication, though the reservoir is usually located at a greater elevation to simulate force feed or flood lubrication by virtue of the increase in head. In such a system the oil is recovered in the base of the machine, or in drip pans, and filtered before re-use.

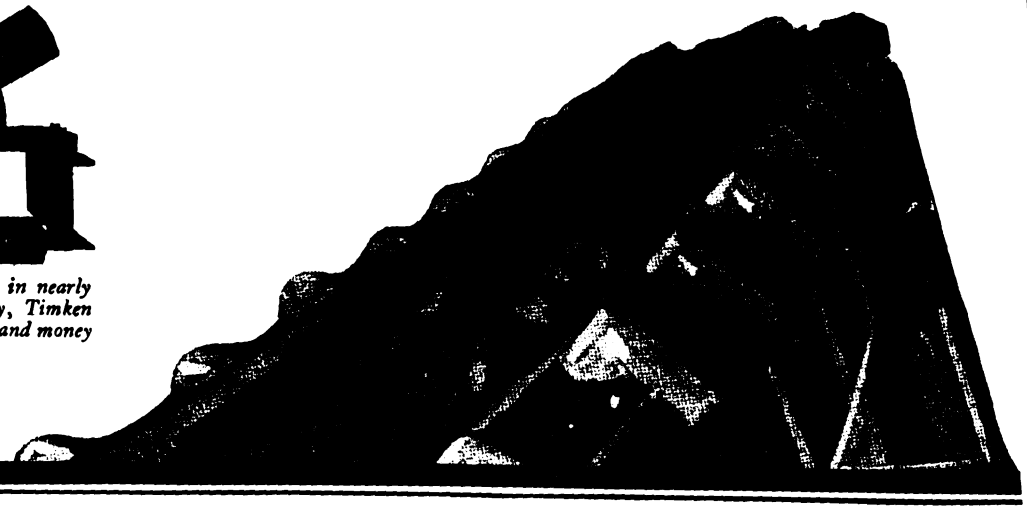
The circulating gravity feed system differs from the simple gravity installation, in that the entire process is automatic, and the oil after filtration and purification is returned to the storage (or feed) reservoir by a suitable pump usually operated from the machine which is being served. Oil distribution to the bearings is in general, similar to the gravity feed principle, but after it has served its purpose it is pumped or run by gravity from the machine base into some form of purification device. From here it is pumped back to the storage reservoir for re-use.

Mechanical force feed lubrication is the most positive in supplying oil to the bearings, of any of the so-called automatic systems. As a general rule the oil is forced to the bearings at a pressure of from 5 to 15 pounds per square inch. No overhead storage tank is required and the oil is circulated by means of a suitable pump driven by the unit being oiled. Owing to the fact that the oil is forced to the bearings under a constant pressure, the oil films maintained by this pressure are capable of supporting heavier loads. Hence, smaller bearing surfaces are possible. Today, this system of lubrication is extensively used for steam turbine service, where high speeds, heavy loads and the necessity for using an extremely high grade of lubricating oil, demand the most perfect lubricating system attainable, if the unit is to be kept running day after day without hot bearings, emulsions, or other breakdowns in the oiling apparatus.

The oil which flows to the bearings, over crosshead and other wearing surfaces, is drained directly to a sump or reservoir usually in the base of the machine. From here it is pumped to the distribution system again. It can be appreciated that the sump should be of sufficient capacity to allow the returned oil to cool and precipitate any water and foreign matter which it may have collected. For this reason the pump suction should never be taken too near the bottom of the sump and it should always be sufficiently above any pos-



In the idlers of Brownhoist conveyors, as in nearly every other type of industrial machinery, Timken Tapered Roller Bearings are saving power and money



BROWNHOIST and TIMKEN Tapered ROLLER BEARINGS

MATERIAL HANDLING EQUIPMENT

Brownhoist Material Handling Equipment has been known for its perfection of design and quality for more than forty years. It is natural that the Brown Hoisting Machinery Company should maintain its policy of building only the best, by adopting Timken Tapered Roller Bearings as standard equipment in its belt conveyors. Whether in belt or chain conveyors, Timken Bearings assure

—maximum conservation of power by reducing friction to a minimum

—economy in lubrication by the ample dust-proof space allowed for grease

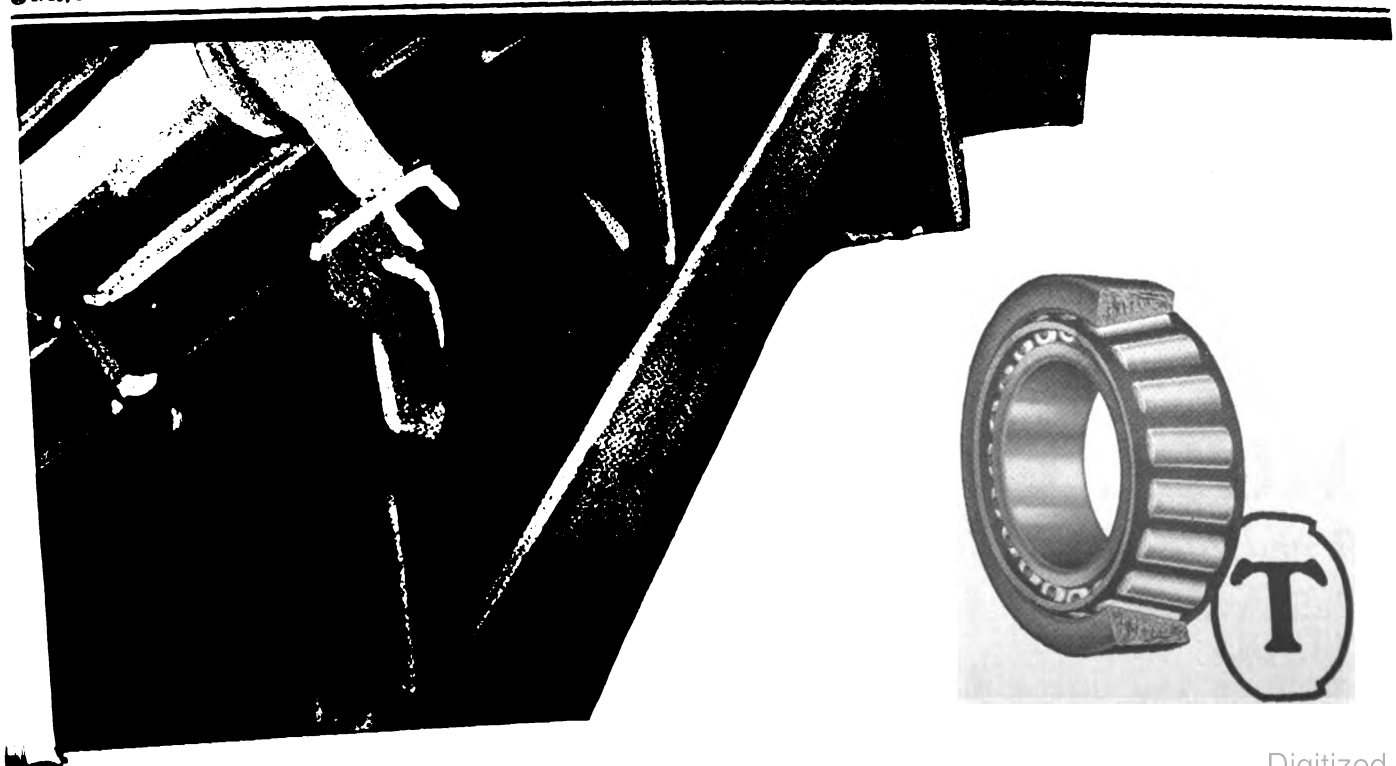
—smoother, quieter, vibrationless operation, through their ability to carry radial loads and thrust loads and resultant loads

—a longer period of attentionless, dependable service, because of the tapered principle upon which Timken Roller Bearings are built.

The heavy loads of sand, gravel, coal, or ore, and like materials, which conveyors must carry, require a bearing of the greatest stamina. That Timken Tapered Roller Bearings have that stamina is well proved by the 76,000,000 Timkens in service in all types of machinery.

The Timken Roller Bearing Co
CANTON, OHIO

© 1923, T R B Co, Canton, Ohio



Digitized by Google

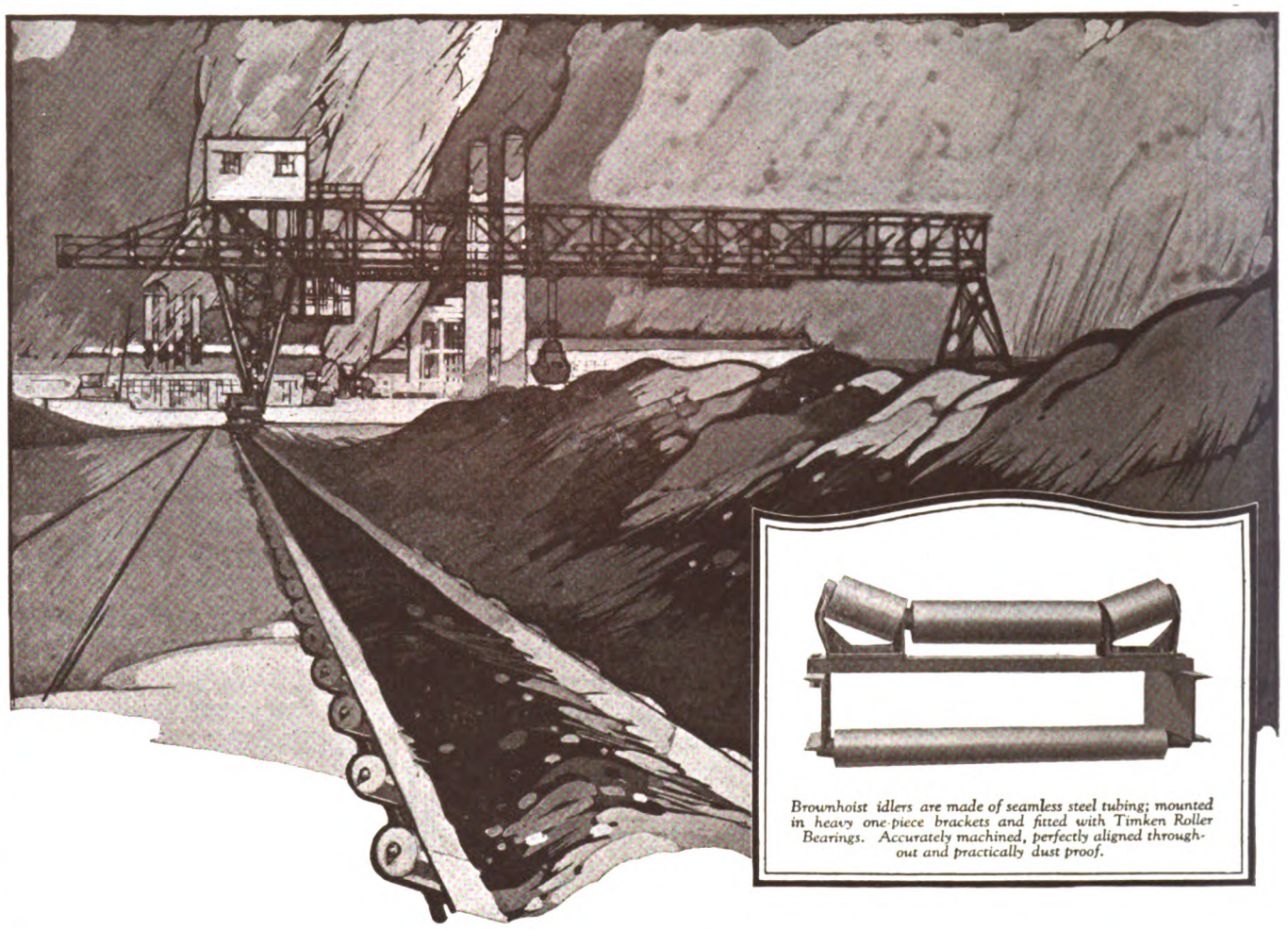
sible water level. Were water to be drawn into the lubricating system with the oil, it would often cause emulsions to form which would most certainly result in poor lubrication.

Forced feed lubricating pumps may be either installed geared to the main shaft and located in the base of the engine above the oil level in the sump, chain driven, or in the form of a rotary pump which is entirely submerged in the oil and driven from the main shaft by chain and sprocket or some other means of power transmission. It has been stated that mechanical force feed lubrication is more positive in action, but this is naturally limited to the operation of the pump and the capacity of the gravity tank. In other words, should the pump break down the supply of oil will soon cease unless the tank has sufficient capacity to carry on lubrication to serve the machine for the length of time necessary to make repairs, unless the pumps are installed in duplicate.

Splash lubrication is a popular type of installation on both horizontal and vertical types of engines where the crank case is entirely enclosed and all joints are oil-tight. It has three marked advantages, *i. e.*, simplicity, cheapness and few parts. But there is also a disadvantage pertaining that should never be overlooked, *i. e.* The oil in the crank case will be subject to fairly rapid deterioration due to the churning it receives, oxidation, lack of radiation of the heat accumulated from the bearings, emulsion with water that may leak into the system and accumulation of foreign matter such as metallic particles, dust, dirt or sludge. In operation, the crankshaft as it revolves, dips into the oil in the bottom of the crank case. By means of an attached disc, or tube device, a certain amount of oil is thus carried or thrown to the top of the crank case. Here it is trapped by grooves or pipes, or scraped off into ducts which lead it to the crosshead pin, guides, and governor mechanism, etc. The crankpin bearing generally receives its lubrication by an independent pipe through which the oil is forced during revolution. Any excess oil returns by gravity to the crank case for further usage. There should always be installed a suitable means for draining the water from the bottom of the crank case, with a gage glass attachment indicating the height of water and oil. Frequent observation is strongly recommended since, were water ever splashed up instead of oil, it would mean a set of bad bearings in a very short time. Water is the detrimental feature in both the splash and force feed systems, and due precautions should always be taken for its removal. Especially in vertical steam engines, the possibility of condensed steam draining into the crank case via faulty stuffing boxes is very prevalent. Baffle plates or secondary stuffing boxes will prevent this to a great extent, and as well, they will prevent oil from being carried into the cylinder, and will keep the crosshead free from excessive heat radiated from the cylinder.

But not only is it necessary to lubricate bearings and the other various working mechanisms of the power plant en-

(*Continued on page 41*)



Brownhoist idlers are made of seamless steel tubing; mounted in heavy one-piece brackets and fitted with Timken Roller Bearings. Accurately machined, perfectly aligned throughout and practically dust proof.

Built To Reduce Conveying Costs

Brownhoist Products

Heavy Dock Machinery
Locomotive Cranes
Monorail Trolleys
Concrete Bunkers
Chain Conveyors
Belt Conveyors
Coal Crushers
Bridge Cranes
Buckets

Literature on request

The first cost is of course important in choosing belt conveyor equipment. But, because that cost is spread over a long period of service, up-keep is a more important factor.

Realizing this, Brownhoist Belt Conveyors have been designed to reduce up-keep cost to a minimum.

Up-keep in belt conveyors is measured by wear on the belt and on the idlers and by power requirements. Brownhoist idlers are designed to give perfect alignment and a minimum of frictional resistance. Timken Roller Bearings are standard in all Brownhoist idlers and each bearing is greased by means of a high pressure lubrication system.

These features undoubtedly make the Brownhoist idlers last longer and assure longer life for the conveyor belt.

The Brown Hoisting Machinery Co., *Cleveland, Ohio*
Branch Offices: New York, Chicago, Pittsburgh, San Francisco, New Orleans

BROWNHOIST

MATERIAL HANDLING EQUIPMENT

Digitized by Google

G.P.&F. Service
Knowing How Since '81

STAMPINGS and SHEET METAL PARTS

Made to your order and Design







IF you are now using pressed metal, let us show you the benefit of having them made in our plant. If you are using castings, forgings or wooden parts in large numbers, our engineers can design pressed steel parts to take their place.

The component parts of hundreds of mechanical products are now being made from pressed metal parts and stampings.

These offer the best solution to lower manufacturing costs and more uniformity of products.

This fifteen acre plant equipped with the most modern machinery offers ample facilities to handle the most difficult jobs without waste of time or material.

A Hundred Thousand parts of every description are turned out daily.

Over 41 years Experience has built up a reputation as specialists in this work.

We Specialize in
DRAWING,
STAMPING
PUNCHING,
SPINNING
FORMING &
BLANKGIN
in Aluminum, Brass, Copper, Sheet Steel, Tin Plate and Sheet Zinc.

GAS WELDING
ELECTRIC WELDING

PORCELAIN
ENAMELING
TINNING
Japanning
GALVANIZING

It will pay you to avail yourself of G. P. & F. Service. Send us your samples or blue prints for estimates.

GEUDER, PAESCHKE & FREY CO.

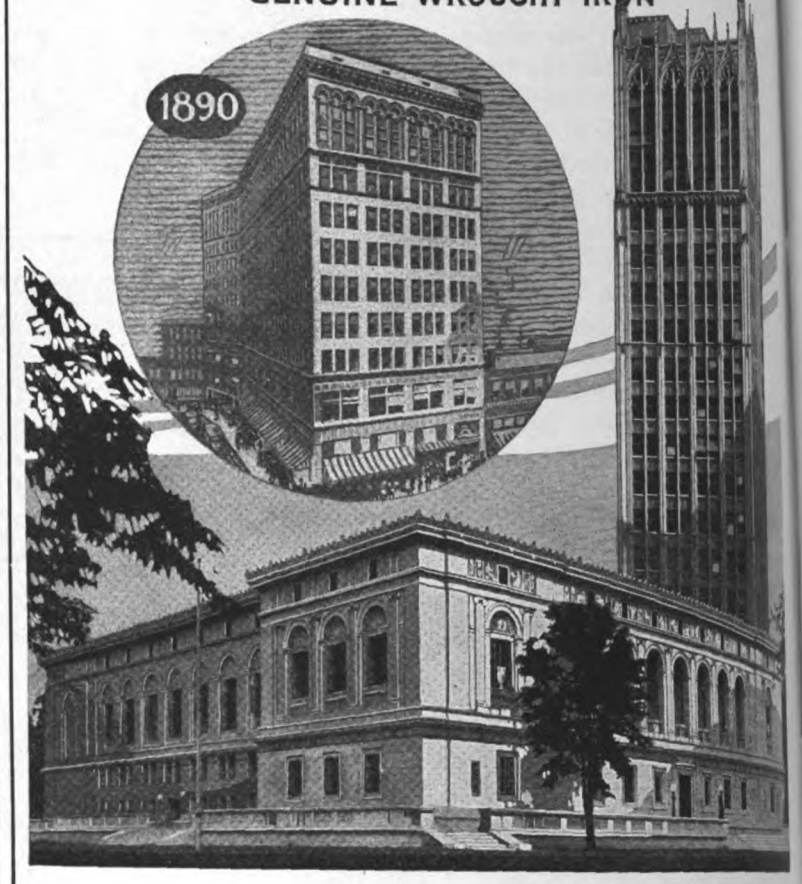
1450-1750 St. Paul Ave. Milwaukee, Wis.
Chicago Office: 352-358 West Ohio St.

Over 15 Acres of Floor Space



BYERS PIPE

GENUINE WROUGHT IRON



1. *Old Garfield Bldg., Cleveland, Ohio. Erected 1890. Byers pipe in heating system.*
2. *New Public Library, Detroit, Mich. Architect: Charles Gilbert, New York City. Byers pipe installed for plumbing and heating.*
3. *New Real Estate Bldg., Detroit, Mich. Architect: Louis Kamper, Detroit. Byers pipe installed throughout.*

Father Time Passes Judgment

THE rust-resistance of a metal cannot be pre-determined by laboratory tests. Only the test of time and service is decisive. So the metallurgist stands aside, waiting for the verdict of Father Time.

The Garfield Building, Cleveland, erected 1890, shown in circle above, furnishes an example of the long life of Byers pipe which is duplicated wherever Byers was installed years ago. The builders of today, profiting by this knowledge, specify and insist on the installation of Byers pipe above or underground, indoors or out, where the greatest durability is desired at a moderate cost.

The diagram shows the average items of cost in a pipe system. The pipe itself is but a small part of the total cost, and the extra cost of Byers pipe is but 5 or 10% of the total cost of the pipe system. Yet the life of the system depends almost entirely on the rust-resistance of the pipe. For when the pipe fails, the entire investment is lost, and more.



Send for Byers Bulletin No. 38 "The Installation Cost of Pipe," containing cost analyses of a variety of plumbing, heating, and power piping systems.

A. M. BYERS COMPANY

Pittsburgh, Pa. Established 1864
New York Philadelphia Boston Cleveland Chicago Houston
Distributors in all jobbing centers

Look for the Name and Year rolled in every length

Digitized by Google

(*Continued from page 39*)

gine, pump or compressor. To keep the steam cylinders and valves in proper condition it is essential that the steam be impregnated with a certain amount of lubricant, prior to its delivery to each unit. Thereby a suitable film of oil will be applied to the valves, piston and rings, valve seat and cylinder wall, to prevent undue wear of these latter as the valve and piston work back and forth against them. Essentially the steam serves as a vehicle to carry and distribute the oil to every part of the mechanism it comes in contact with. To complete the process, however, the lubricant must be applied to the steam by a suitable type of positive action lubricator capable of furnishing the oil drop by drop at any desired frequency. To attain the best results the inlet connection from the lubricator to the steam pipe should be located about two feet above the throttle valve. Thus there is afforded a sufficient length of time for the steam to thoroughly atomize the oil and insure complete mixture of both. In addition, such a connection enables the throttle valve to be properly lubricated, and renders it capable of accurate adjustment to attain any desired engine speed.

In modern practice steam cylinder oils are applied either by a hydrostatic lubricator or some form of mechanical force feed device. In the hydrostatic lubricator operation is attained by the weight of a volume of water, contained either in the condenser bulb or pipe, which forces the oil from the lubricator reservoir into the steam pipe. This body of water is accumulated either by connecting the condenser to the steam pipe about two feet above the oil connection as the case with a single feed device, or extending a pipe from the main steam header down to the lubricator tank as in the multiple feed lubricating system. The principle of operation in each case is the same, however, involving merely a suitable pressure difference attained by the gravitational weight of the water sufficient to force the oil into the steam via the atomizer.

The multiple feed system is by far the more automatic of the two, and requires filling with oil but once every several days, while the single feed lubricator, in general, has but small capacity, *i. e.* One quart maximum. Naturally, therefore, frequent re-filling is necessary and its positiveness of action depends largely upon the vigilance of the engineer. The multiple feed system of hydrostatic lubrication is admirable when several steam operated, reciprocating units are included in the power plant. In such cases an oil reservoir of from five to fifteen gallons capacity can be installed, with a single condenser pipe leading to the steam header. Oil distribution to the lubricators on the various pumps and engines, etc., is carried out via a main oil header connected to the reservoir, with leads dropping therefrom to each unit as desired. This system is, however, usually not preferred on a single unit only, owing to the increased expense of erection. In such cases the mechanical forced feed lubricator is generally installed, or a single feed hydrostatic appliance.

Frequently it may be desirable to equip the steam engines and other units of the entire plant with mechanical force feed cylinder lubricators operated from the reciprocating mechanisms. In fact, many engine and compressor builders are standardizing on such equipment today. Some of these devices, however, possess the disadvantage of relatively low capacity, though on the whole, the mechanical force feed lubricator is a far more valuable equipment from the viewpoint of proper oil supply and economy. It stands to reason that an engine will not require the same amount of steam cylinder oil at low speeds as at higher rates of operation. With a hydrostatic installation the rate of oil feed is absolutely dependent upon the operator, and his judgment of the number of drops that should be fed per minute. The mechanical lubricator, however, varies the rate of oil feed automatically with the R. P. M. of the unit. Thus, after the apparatus has been set for what is technically considered a correct oil flow at normal operating speed, it requires no further attention in this regard. Such a device is

ONEIDA

STEEL SPLIT PULLEYS



A pulley that has cut power costs in thousands of industrial plants

Loose belts reduce friction in bearings and prolongs belt life. The oval crown of the Oneida pulley insures the greatest possible belt grip or adhesion—this permits operation under low belt tension and insures maximum transmission of power with minimum expense of belt pull or tension.

Oneida pulleys may be run with safety at any speed at which it is practicable to operate a belt.

The arms, as well as hubs of the Oneida, are made in two pieces—interwoven into the flanges of the hub and securely riveted into place.

Double arms are provided beginning at 8-inch face in the smaller sizes, 10 and 12-inch in the medium and larger sizes.

Order Oneida pulleys from your local dealer on the immediate delivery basis.

DODGE

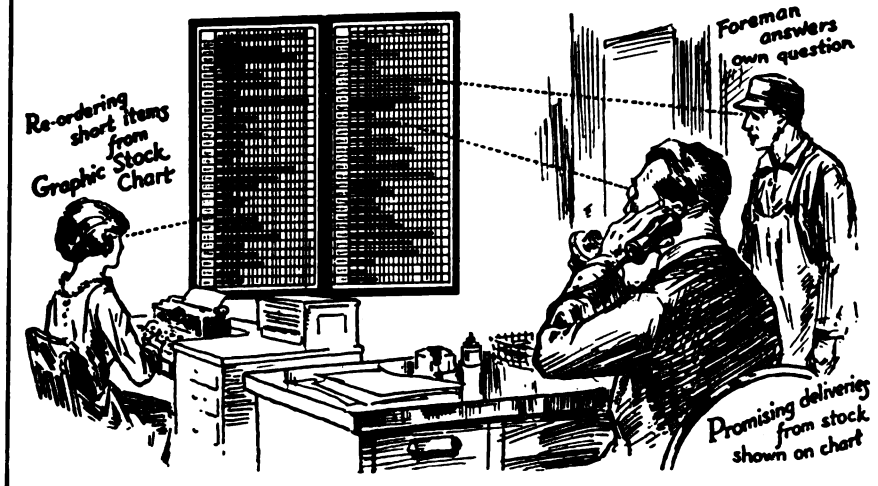
Power Transmission Machinery

DODGE MANUFACTURING CORPORATION

General Offices: Mishawaka, Indiana. Works: Mishawaka, Indiana, and Oneida, N. Y.
Dodge Manufacturing Company of Canada, Ltd., Toronto and Montreal

New York, Boston, Philadelphia, Pittsburgh, Atlanta, Cincinnati, Minneapolis, Houston, Seattle, St. Louis, Chicago, San Francisco

Digitized by Google



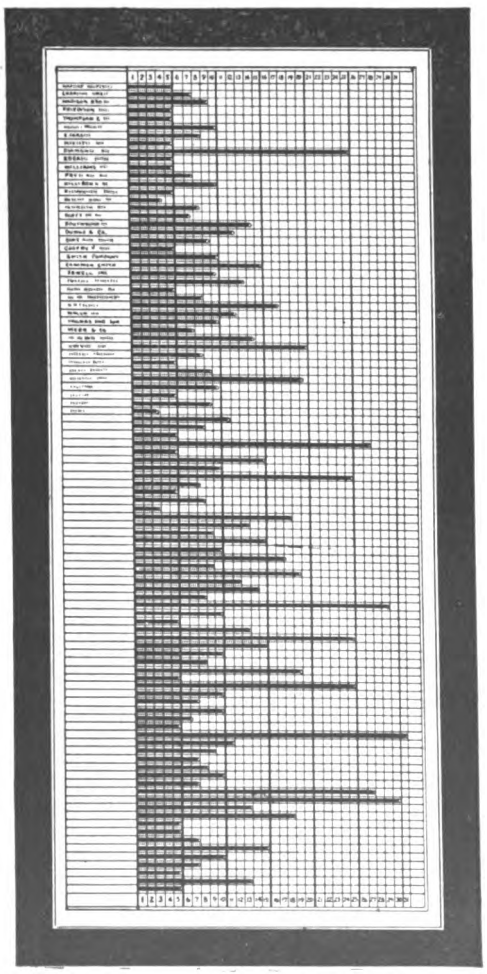
KNOW YOUR STOCK

Keep a perpetual GRAPHIC INVENTORY to watch

Raw Materials **Fast Moving Items** **Height of Reservoirs**
Perishable Stocks **Height of Oil in Tanks** **Stocks of Coal**
and other vital facts in your business

EDEXCO MECHANICAL BAR CHARTS

used as Inventories will show the absolutely up-to-the-minute condition of stock on as many items as desired.



The sliding tape advances across the scale as stock on any item is taken in and recedes as shipments or withdrawals are made.

Will cover one item or thousands

Edexco Graphic Inventories are easily read across an ordinary office, saving incalculable time over type-written sheets or stock books.

Send today for literature

and check sheet
"GRAPHIC PRODUCTION CONTROL"

100 Item Bar Chart
Six feet high by 40 inches wide. Tapes slide across the scale.

EDUCATIONAL EXHIBITION CO.
427 CUSTOM HOUSE ST. **PROVIDENCE, R. I.**

especially adaptable to a multiple expansion steam engine, since it is generally built with two or more oil pumps whose discharge can be piped directly to each respective steam inlet.

There are a number of other steam cylinder oil lubricators in use today involving the principle of the sight feed oil cup. In general they are attached directly to the steam chest. This in itself is bad practice since any oil dropping into the chest will generally be carried in bulk to the exhaust without sufficient atomization to lubricate the wearing parts to any great extent. They are, however, automatic in operation as long as they are kept properly filled and the flow regulated.

UNIFORM provisions governing the travel of persons suffering from contagious diseases are now in force over a large part of the United States, says the U. S. Public Health Service, in a bulletin just issued. Twenty states (Alabama, Florida, Georgia, Illinois, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, New Hampshire, North Dakota, South Carolina, Tennessee, Virginia, West Virginia, Washington, and Wisconsin) have already adopted the Standard Railway Sanitary Code approved by the conference of the State and provincial health authorities of North America and later by the U. S. Public Health Service in conference with the health officers of the United States. The essential part of the code has also been incorporated in the United States interstate quarantine regulations.

The code forbids absolutely the travel of persons ill with any of the five major quarantinable diseases: plague, cholera, yellow fever, typhus, and smallpox—the first four because they are not common, and when once started, have enormous possibilities of epidemic spread and are very disturbing to the public mind; and the fifth, smallpox, because in the present imperfect state of vaccination, the possibility of transmitting the disease from patients cannot be entirely avoided under travel conditions.

Still Best After Test of 8 Years

Invariably manufacturers wishing to prove the mechanical merit of anything resort to a rigorous test of some sort.

Abundant proof of the superiority of the Steam Trap Sarco over the costlier, more cumbersome bucket or float type of trap is furnished by two New York manufacturers who replaced float traps with Sarco Traps more than eight years ago.

For eight years the Sarco has been saving steam and money for Walter W. De Bevoise and for Henry Heide of Brooklyn—just two of the many hundreds of manufacturers who have found that the Sarco serves as a valve, a by-pass, a check valve and a steam trap all in one.

When steam is shut off at night the Sarco opens automatically and stays open until steam is turned on again. When steam comes on in the morning it forces all the air out and closes the trap, which stays shut until condensation again opens it.

You can install the Steam Trap Sarco for one-third the cost of bucket or float traps and they'll do the same work.

As evidence of Sarco dependability, we quote just a few names of prominent Sarco users:

New York Central Railroad, Pennsylvania Railroad, Erie Railroad, D. L. & W. Railroad, Consolidated Gas Company, Standard Oil Company, Atlas Powder Company, William Cramp & Sons Shipyards, and many, many others.

Let us send you a Sarco on 30 days' trial. If you are willing to part with it at the end of this period, send it back and it will cost you nothing. Write for Booklet R-20.

SARCO CO. Inc.
236 BROADWAY
New York

Buffalo
Chicago
Cleveland
Detroit
Philadelphia



Digitized by Google

What the Freight Engine is to the Railroad—
What the Tugboat is to Navigation—

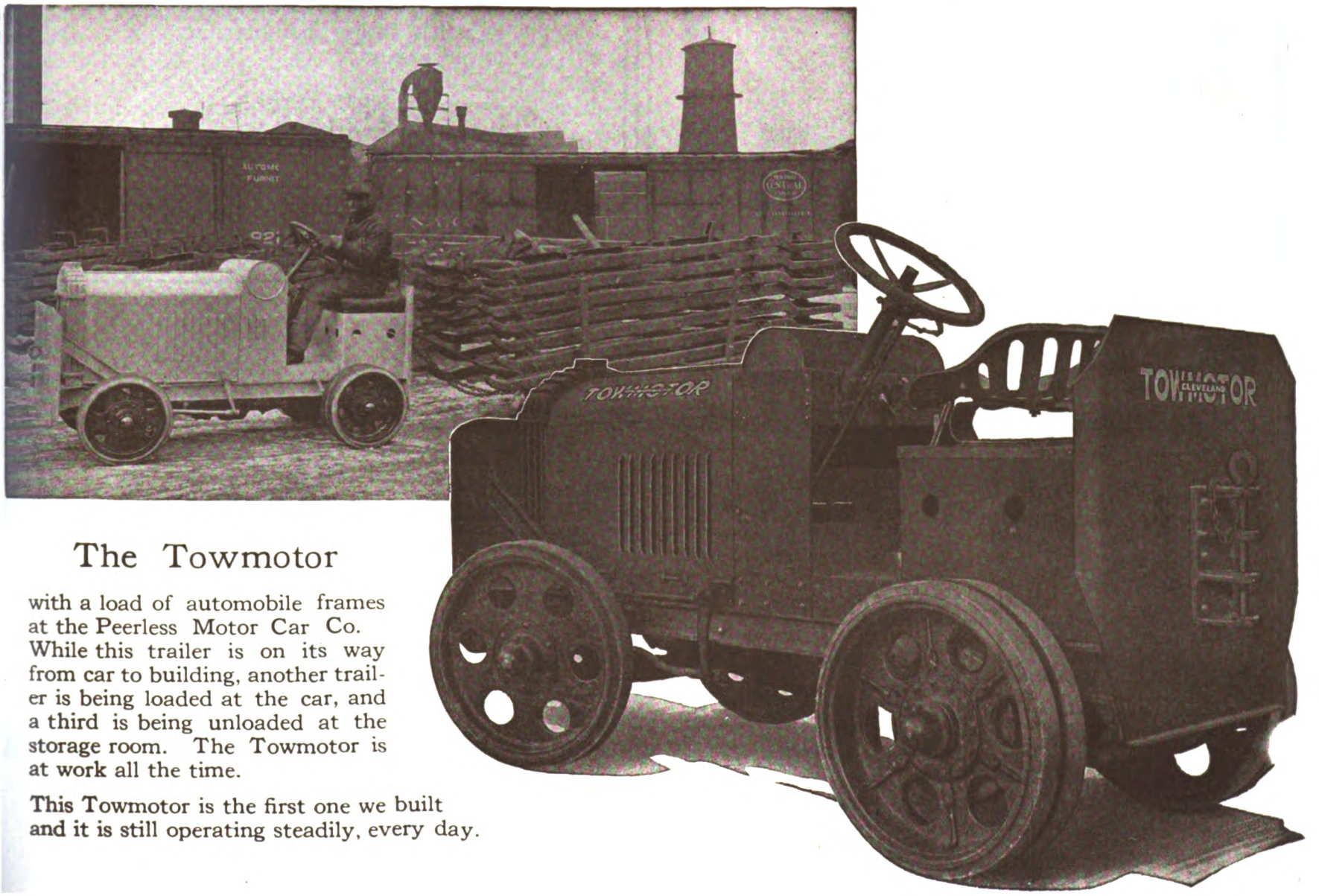
THE TOWMOTOR

is to Industrial Transportation.

Whether your work is inside your building or outside—Whether you want a tractor one hour a day or twenty four, The Towmotor is always on the job, always ready to go.

The Towmotor is built in the sturdiest, most substantial way we could devise, so it would stand up under the strenuous demands made upon a tractor in industrial use.

Its units are standard, which makes it easy to repair in case of accident.



The Towmotor

with a load of automobile frames at the Peerless Motor Car Co. While this trailer is on its way from car to building, another trailer is being loaded at the car, and a third is being unloaded at the storage room. The Towmotor is at work all the time.

This Towmotor is the first one we built and it is still operating steadily, every day.

THE TOWMOTOR COMPANY
1226 East 152d St,
Cleveland, Ohio.

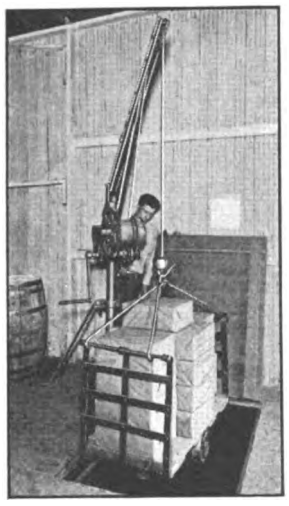
THE TOWMOTOR

Digitized by Google

It Pays—

to handle loads such as the following with a G & G Hoist. Check the kind of load handling you are interested in, send this ad to us, and we will show you why it is profitable to use G & G equipment.

☐ Ashes	☐ Boxes	☐ Drums
☐ Bags	☐ Carboys	☐ Floor Trucks
☐ Bales	☐ Cartons	☐ Rubbish
☐ Barrels	☐ Cases	☐ Sacks



The Great Western Paper Box Co., St. Louis, Mo.

(above) uses a G & G Model B Non-Telescopic manually operated Hoist to raise and lower loaded floor trucks between floors.

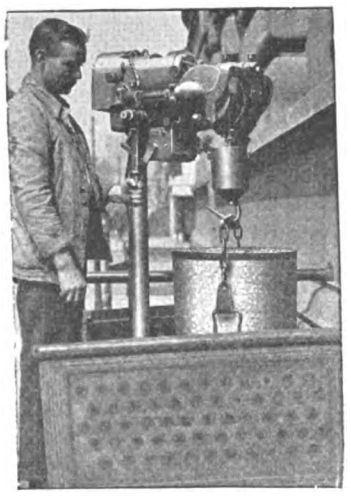
The Packard Motor Car Factory, Detroit, Mich.

(below) uses a G & G Model A Non-Telescopic manually operated Hoist to raise core sand. 3 other G & G Hoists are in this plant.



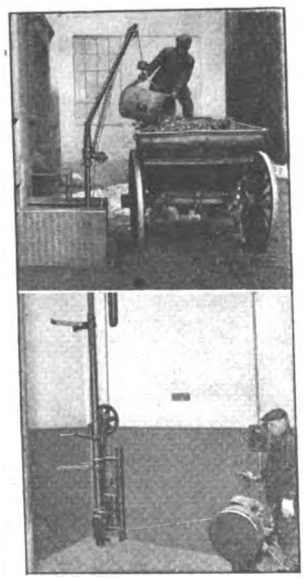
The Mergenthaler Linotype Co., Brooklyn, N. Y.

(below) uses a G & G Model D Telescopic electrically operated Hoist for ash removal. Test shows this Hoist raises and lowers 26 cans for 1c current consumption.



The New York Telephone Co. (main bldg.) Brooklyn N. Y.

(above) uses a G & G Model E Telescopic electrically operated Hoist for ash removal. The Bell system has 86 G & G Hoists in its various buildings.



Write for booklet—"Industrial Plants Need This Hoist."

GILLIS & GEOGHEGAN

556 West Broadway, New York, N. Y.

The G&G Telescopic Hoist
REG. U.S. PAT. OFF.
with Automatic Gear Shifting Brake Device and Silencer



Records Speak Volumes

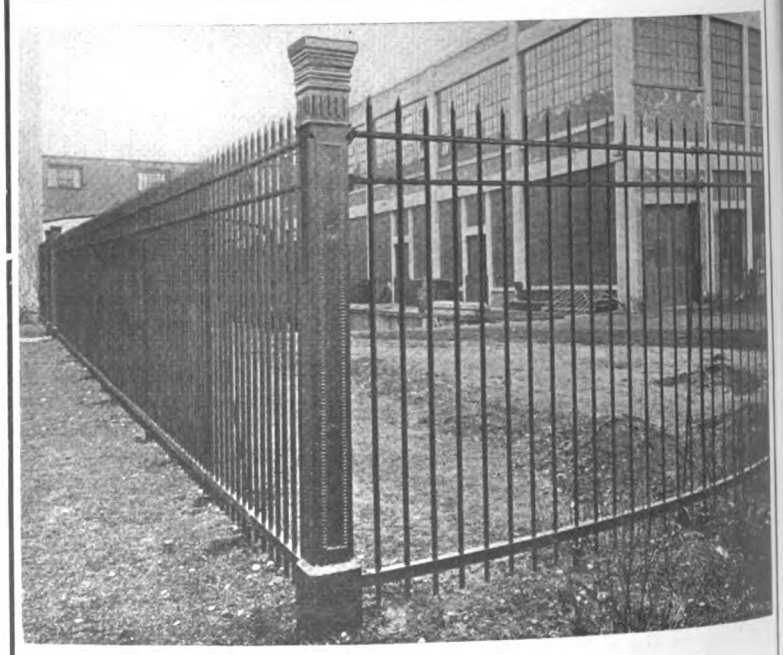
The unusual qualities of Caldwell Cypress Tanks are proven by their enviable records in all sections of the country. Perhaps this is largely due to the fact that, of all woods, cypress is the one which lasts best outside its native climate.

Thirty years' experience in building tanks enables us to couple this remarkable tank wood with workmanship and design that insure the maximum of tank satisfaction.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook St. Louisville, Ky.

Caldwell TANKS AND TOWERS



Know What It Costs

Get a price on that fencing you need for your plant. Iron or wire—it doesn't cost as much as you think. Our special service plan puts before you detailed specifications and complete cost figures on the entire job. Write today for catalog—see the blue print of the fencing you are wanting—and know the price. Then decide.

ENTERPRISE IRON WORKS, 1105 E. 24th St., Indianapolis, Ind.

ENTERPRISE
All-Iron **FENCING** *Chain-Link*

Digitized by Google

Managing the Move

(*Continued from page 26*)

were taken separately for every type of office furniture in common use. Each element was planned and defined in advance and symbolized mnemonically, to facilitate rapid and accurate study. Then the studies were compiled and the elements figured. The results were a series of elemental times from which we could determine exactly the length of time and the number of men required to move each type of office furniture.

In managing the move of a large commercial educational organization in New York recently we had an opportunity to use and test these standards. The lowest bid received from a moving company here was $1,400. We advised that instead of letting the contract on a lump-sum basis, the job be handled on an hourly basis. This was done. The work was carefully laid out according to our standards, and as a result the cost was only $600—a saving of 57 per cent of the original bid of this same moving company.

The money paid to movers represents, however, only a small proportion of the cost of moving. Any saving here is spectacular because it shows up instantly in the expense account. But even greater than the cost of transportation is the loss caused by the interruption of business, the deflection of office workers from their regular duties to the tasks of rearranging furniture and getting settled in the new quarters. The great contribution of scientific management here is not in reducing the fee of the moving company—though that saving may be substantial—but in reducing the period of interruption to the lowest attainable minimum.

An Eastern life insurance company transferred to new offices recently. The move occupied six days, a full week. In striking contrast is the educational organization mentioned above; with scientific management it was moved in 12 hours. The movers began promptly at the stroke of 12 noon Saturday and by midnight everything was in place in the new offices—desks, files, equipment of every kind, all ready for the opening of business Monday.

The same principles of management were applied to the moving of the bank. Here the schedule called for beginning the move promptly at 1 o'clock Saturday, when the employes finished their work, the move to be completed at 11 p. m. the same day. The safe movers, a separate organization, were delayed in some way, which kept the elevators in their service until 3 o'clock. The move was therefore two hours late in starting but in spite of this handicap it was completed by 11:30, only half an hour behind schedule. Originally we planned to place the furniture in permanent position as fast as it arrived in the new quarters. But painters, plumbers, electricians, and laborers were still at work putting on the finishing touches Saturday night, so the placing had to be postponed until next day. With a few hours of Sunday work the job was completed, and the bank opened Monday, with everything in order and all the clerks at their desks, at the usual opening hour, 9 o'clock. Not an hour of working time was lost. The management of the bank showed its confidence in the move schedule by inviting its patrons to a reception Monday morning, and the customers who had transacted business at the old bank Saturday morning were astonished to find it installed in full working order in its new quarters at the opening hour Monday.

The secret of this saving of time and energy lies in the use of the twin principles of management—analysis and planning. By analyzing every factor involved in the move, every factor in the old quarters as well as in the new, and organizing a plan for handling these economically, the move goes forward as so much teamwork. The trouble with most moves is that the concerns look upon them as emergencies to be cared for by the moving company; and the moving company looks upon the job as simply one of getting so many truck loads of furniture from one place to another. But the problem of transportation is really

(*Continued on page 47*)

Moving air did this—



Harness it—

for profit in your plant

Down on this little Indiana town swept an immense unseen power—the power of moving air, uncontrolled—a power capable of uprooting mighty trees and wrecking sturdy buildings.

This power seized, boxed, delivered and made to work for your profit will mean the elimination of extra and unnecessary operations and a material reduction in operating costs.

Clarage-Kalamazoo Blowers and Exhausters are at work in plants of all kinds,—harnessing the power of the tornado, controlling and delivering air that conveys light materials such as paper, cotton, wool, hemp and rags, doing it at a fraction of the cost of trucking.

Clarage-Kalamazoo Fans are improving air conditions, collecting dust and dirt and reducing the fire hazard. They are stopping condensation. They are increasing gas production. They are drawing off waste heat from various kinds of ovens and kilns, turning it to heating and drying purposes—and they are boosting the capacity and efficiency of boilers in every section of the country.

Clarage-Kalamazoo Fans can turn the vast powers of moving air to your profit in a hundred ways.

You have a problem similar to those above. Let our engineers know what it is. They will solve it with the right fan for the purpose.

Clarage Fan Co., Kalamazoo, Michigan

New York City	Pittsburgh	Los Angeles	Chicago
Minneapolis	Detroit	Philadelphia	Indianapolis
Cleveland	New England Elec.	Equip. Co., Boston	Rochester, N. Y.

Complete stocks carried in New York, Pittsburgh and Memphis

CLARAGE KALAMAZOO Multiblade Fans



The Book!

—waiting for your request. It tells you how to harness moving air—

Ask for it

MAIL THIS COUPON FOR FREE COPY Ind. Ill. 4-23

Clarage Fan Co., Kalamazoo, Mich.
Send a copy of your booklet explaining the possibilities of moving air.

Company.....

Address.....

Your Name.....

Digitized by Google



The Royersford Needle Works. Finished in 47 days. Our clients were so satisfied they recommended us to others, which explains

WHY

we secured the contract to erect the building for the Apex Hosiery Co., Philadelphia.

Foundry Building, Hills - Jones Plant of the Consolidated Machine Tool Co., Wilmington, Del.

Save Time and Money through the Beling-Bush System of Standardized Building.

YOU owe it to yourself and your company to investigate the Beling-Bush Method of Standardized Factory Construction. We can build your new plant or that addition in 30, 60 or 90 days. You'll find our work so high-class and thorough that you too will go out of your way to recommend us to your friends when they want to build. With us you save because of centralized responsibility on plans and construction and in the elimination of a vast amount of time and effort.

If you are considering a new building, write us for our catalog and information. Such an inquiry involves you in no way, yet it may result to our mutual satisfaction.

THE BELING-BUSH CO., INC.

Factory Engineers and Builders

THE

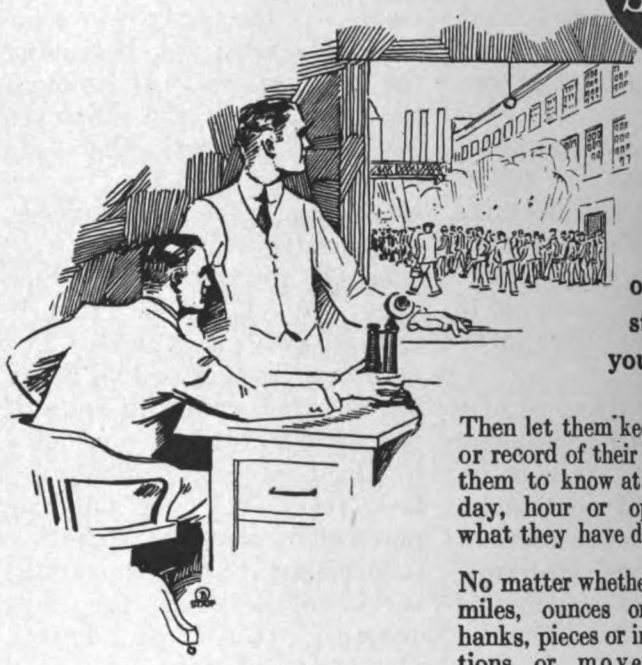
Drexel Building Philadelphia, Pa.

SERVICE



THE SOLUTION

Do You Want To Avoid Strikes?



or misunderstanding with your employes?

Then let them keep accurate count or record of their own work—allow them to know at the end of each day, hour or operation—exactly what they have done.

No matter whether this is inches or miles, ounces or tons, picks or hanks, pieces or individuals, operations or movements—*Root Counters can give an accurate and verified record of it.*

Why not allow our Engineers to come to your plant, at no cost to you and see what they can save by suggestions.

ROOT

Bristol, Conn.



Uses 25% less ice

Prepare your plant now for summer weather

THIRST is the enemy of energy. Thus proper drinking water facilities are a most important consideration in planning your summer production.

Jewett *Square* Water Coolers--installed in connection with the regular water system, provide an ample supply of refreshing, cooled drinking water that counteracts the energy-sapping effect of hot weather, and vitalizes and invigorates your workers.

Even though your plant is equipped with coolers, you may be interested in the numerous advantages of the Jewett: its convenient, sanitary angle-flow bubbler—and the decided saving in labor and ice from its square design and thick, insulated walls.

We will gladly mail complete information and prices upon request.

The Jewett Refrigerator Co.,
Established 1849
36 Chandler St., Buffalo, N. Y.

JEWETT
SQUARE WATER COOLER

Digitized by Google

"The Reeves"

VARIABLE SPEED TRANSMISSION



Installation of a No. 6½-E REEVES Transmission operating stoker shaft at New York Edison Co.

Variation of speeds easily and quickly obtained

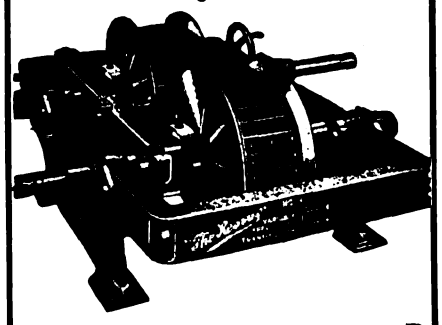
Application to stokers in lighting and power stations makes it possible to anticipate heavy loads and to take care of sudden "peaks."

By regulating the speed of stokers through "The Reeves" Variable Speed Transmission, precisely the right amount of coal is fed into the furnace at all times, assuring perfect combustion and securing the greatest amount of heat units per ton of coal.

A slow or normal fire can be maintained until there is a call for more power, or when a dark storm is approaching, then the speed of the stoker is increased by means of "The Reeves" Transmission, until the proper amount of coal is being stoked to produce the necessary power.

The original installation of "The Reeves" Transmission made with the New York Edison Company was in 1912. This machine was subjected to a rigid experimental test, which proved that it effected such great saving in coal that it paid for itself in an incredibly short time. The performance of this machine has resulted in the installation of a great number of REEVES Transmissions with this company.

Write for our new 52-page catalog, L-44.



REEVES PULLEY CO.

Columbus, Indiana

(*Continued from page 45*)

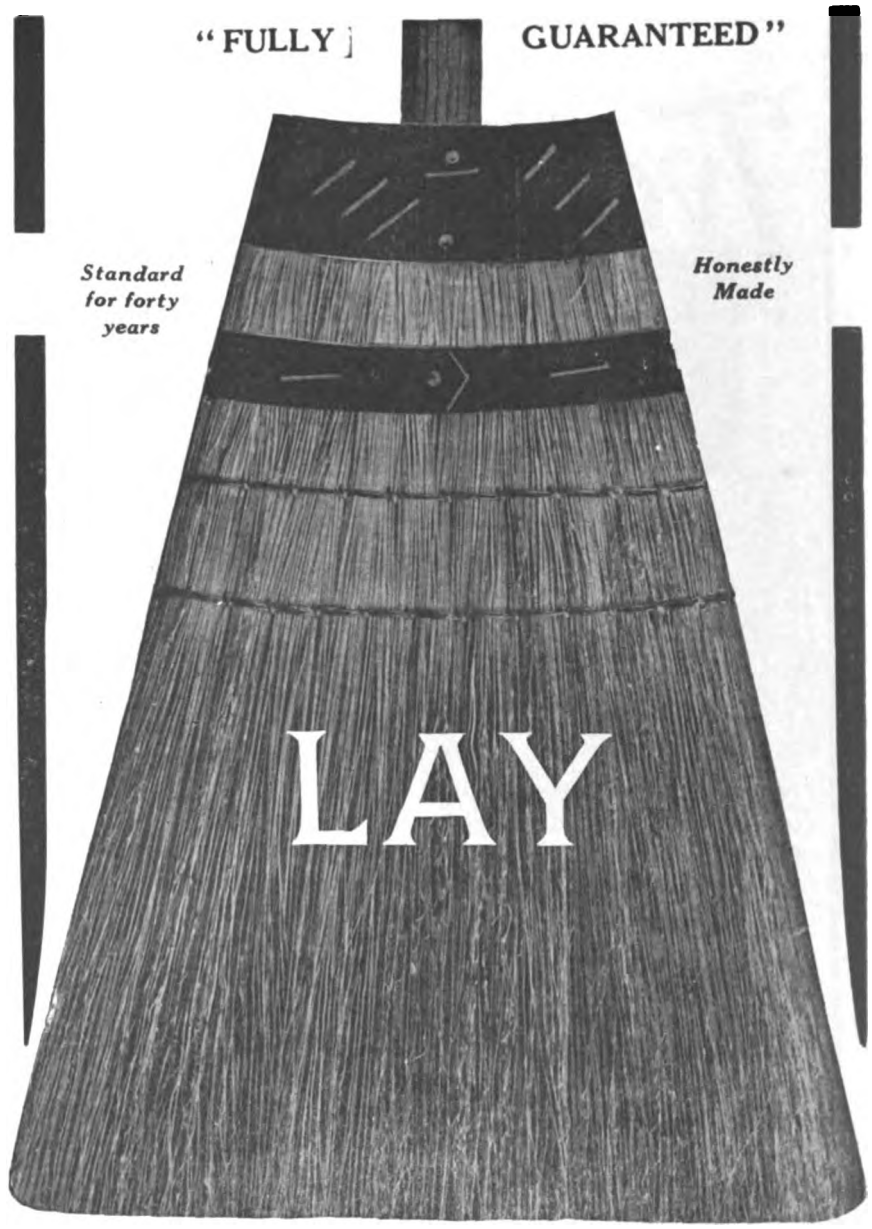
only a part of the whole problem, which includes the arrangement of the new quarters, the placing of the furniture according to this arrangement, and all the incidental details of providing means for quickly identifying equipment and assigned spaces, and facilitating the handling and prompt placing of what is moved.

The definite layout of the arrangement of furniture in the new offices is a necessary preliminary to management of the move. The procedure here is as follows: First make a floor plan of the old office, of conditions as they now are. The whole should be carefully drawn to scale, every piece of equipment indicated. It may be that in this survey of present conditions certain pieces of furniture can be marked for the second-hand shop. This is one of the blessings of a move, the opportunity it gives to get rid of old equipment which has outlived its usefulness and to purchase new standardized equipment. Where such pieces of furniture are marked for discard, the problem of moving is simplified to that extent; for the old furniture may be left behind for the second-hand buyer, and the new furniture will of course be delivered in place at the new quarters by the seller.

After the floor plan of the present office has been made, draw a plan of the new office space. It will be bare, of course; just a plan of the empty room or rooms to which removal is to be made. The next step is to cut up the floor-plan of the present office into pieces representing the furniture to be moved. This will give a series of templates, which may be moved around on the floor plan of the new office, tried in various positions until the right arrangement is decided on. In planning the new arrangement there is a glorious opportunity to iron out all the defects of the old arrangement—place desks and departments so as to facilitate the routing of work, with proper care also for such items as lighting, ventilation, traffic, intercommunication, cloak rooms, drinking water, and the like. But that is another story.

(Obviously the furniture to be left behind does not figure in this planning, but the new

(*Continued on page 49*)



DURABILITY

THIS vital quality in the Lay Metal Case Broom has enabled thousands of manufacturers to cut their sweeping expenses in half. The long life of our products in the hardest, roughest kind of service means smaller sweeping bills and infrequent re-orders.

Just see the lasting construction and the durability of the materials in these metal case brooms. Every one of them is made from selected stocks of broom-corn, rattan, hickory or bamboo—constant inspection during manufacture insures the use of only the best quality of raw materials. Every broom is constructed according to the best approved scientific engineering principles and the reason why

"They hold their shape till worn to a stub."

Every strand of fibre is held in place in the vise-like grip of staples—not nails. The staples are driven under high pressure and clinch on both sides; there isn't a chance of falling fibre from this construction.

Knock the broom against sharp corners or heavy machinery,—you can't crack or splinter the shoulders,—they're protected by the strong metal case,—doubly re-inforced.

Their sturdy construction, long life, and low cost are responsible for the specification of LAY brooms by 90% of the steel industries, 40% of the railroads and more than 4000 industrials. Every year the

STRENGTH, DURABILITY and ECONOMY

of LAY products are saving these concerns thousands of dollars in sweeping expenses.

These same qualities are built into each of our complete lines of industrial brushes. Every LAY product is backed by three generations of specialization and is unconditionally guaranteed,—you are fully protected.

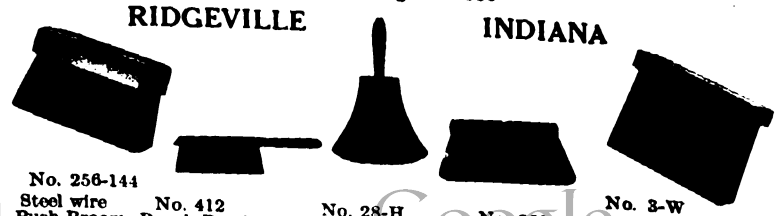
Send for our prices to place your trial order. We are responsible for your satisfaction.

Originators of the Metal Case Broom

THE JOSEPH LAY COMPANY, INC.

120 College Street

RIDGEVILLE INDIANA



No. 256-144 Steel wire Push Broom

No. 412 Bench Brush

No. 28-H Bassine Whisk

No. 253-165 Bass Push Broom

No. 3-W Steel wire Casting Brush

Digitized by Google

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Control



The SIX SENSES
Seeing ~
Feeling ~
Hearing ~
Smelling
Tasting
and ~ ~
Tycos
Temperature
Control

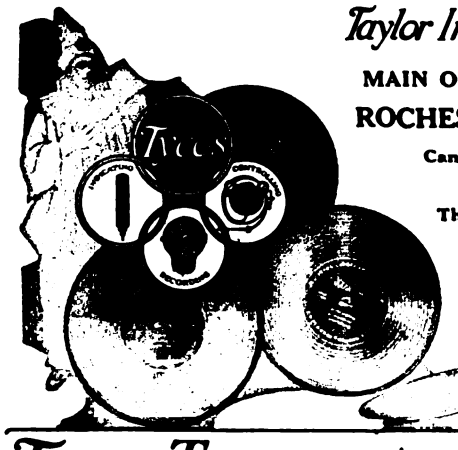
You Hear Famous Artists—Thanks to the "Sixth Sense"

PLACE a record on your phonograph, drop the needle into place and the glorious tones of a famed tenor fairly shake the walls, the soft melody of a woman's voice charms the twilight, or the machine re-creates the sound of violin or piano. You perceive these things by the sense of hearing, to be sure. But, behind the miracle that reproduces the sound waves lie years, of past toil and present accuracy in the perfection of every detail of the phonograph and record. Consider the record itself. It is a tough, elastic substance, composed of certain compounds that must be accurately blended. In this process, heat is employed. The control of this temperature must be exact if the finished "blank" is to prove properly susceptible to reproducing the sound waves when it is pressed by the master record. Behind the making of this master record itself—behind every step in its plating and electroplating, clear back to its production as a plaster cast of the original wax impression of the original harmony, the control of temperature—the "sixth sense" has become as much a part of the everyday industrial world as the sense of hearing itself. The records you listen to are perfect because the records of *Tycos* Instruments that controlled the temperatures employed in their physical production were perfect.

Listen, then, to the voice of American Industries—the voice that proclaims the 8,000 varieties of *Tycos* Temperature Indicating, Recording, Controlling Instruments as the standard of accuracy. Their record extends over years of usage—in conditions that parallel your industry.

MANUFACTURERS

What is your problem of applying this "sixth sense" to your plant? What do you make? Write us and literature on any instrument or type of instrument will be sent you promptly. *Tycos* experts are ready to advise on its application to your plant.



Taylor Instrument Companies

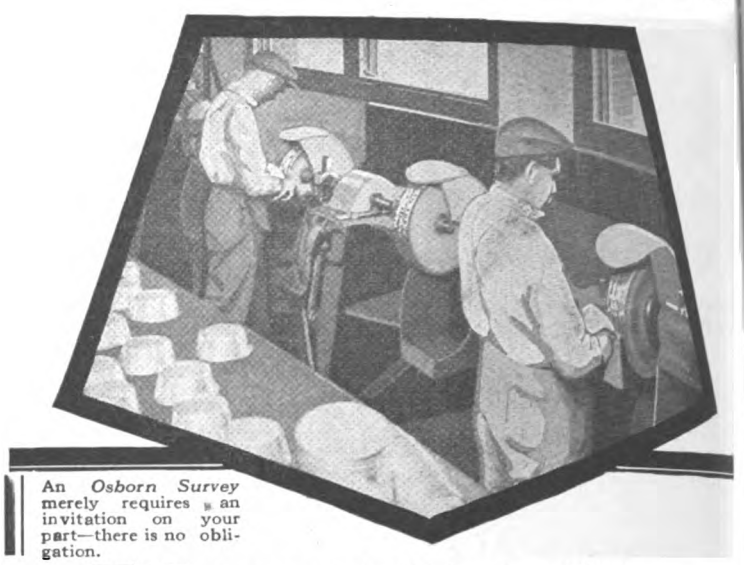
MAIN OFFICE AND FACTORY:
ROCHESTER, N. Y., U. S. A.

Canadian Plant: Tycos Building
Toronto, Canada

There's a *Tycos* or *Taylor* Temperature Instrument for every purpose.

Tycos Temperature Instruments
INDICATING · RECORDING · CONT

342



An *Osborn Survey* merely requires an invitation on your part—there is no obligation.

THE longer we build brushes (this is our 31st year) the more keenly we realize that both the manufacture and the use of brushes is a science not to be mastered by hit-or-miss, rule-of-thumb methods. That is why we have established the *Osborn Brush Survey* as the basis of the procedure in advising a customer. We can't sit at a front office desk and advise intelligently but we can when an Osborn man has made a first hand inspection of your brush uses.

Brush Division of
THE OSBORN MANUFACTURING COMPANY
INCORPORATED
CLEVELAND

New York · Chicago · Detroit · San Francisco

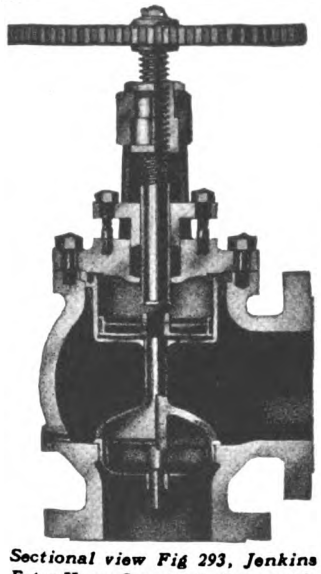
OSBORN

Made for maximum service not merely the average

TRADE JENKINS MARK

Jenkins Bros

To equalize pressures and as a safety feature



This valve automatically shuts off the flow of steam from header to boiler in case a tube should burst or other internal rupture occur, thereby suddenly reducing the pressure in that boiler.

It also equalizes pressures between different boilers in a battery, preventing one boiler form working at a lower pressure than another.

As the valve can only be opened by the pressure in the boiler to which it is attached, it is impossible to accidently turn steam into a boiler which is being cleaned.

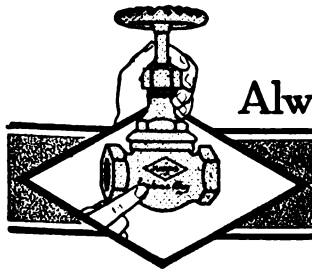
Send for descriptive folder.

JENKINS BROS.

80 White St. ..... New York
524 Atlantic Ave. ..... Boston
133 No. Seventh St. ..... Philadelphia
646 Washington Blvd. ..... Chicago

Sectional view Fig 293, Jenkins Extra Heavy Iron Body Automatic Equalizing Stop and Check Valve.

2730-J



Always marked with the "D

Digitized by Google

(*Continued from page 47*)

furniture to be bought and added does. Accordingly templates of the new pieces, drawn to the same scale as the old, must be made and used in laying out the arrangement. Usually it is better, if conditions permit, to have the new furniture delivered in advance of the move.)

The arrangement planned, the next step is to plan the move and organize the means to be used. There are two important preliminaries here.

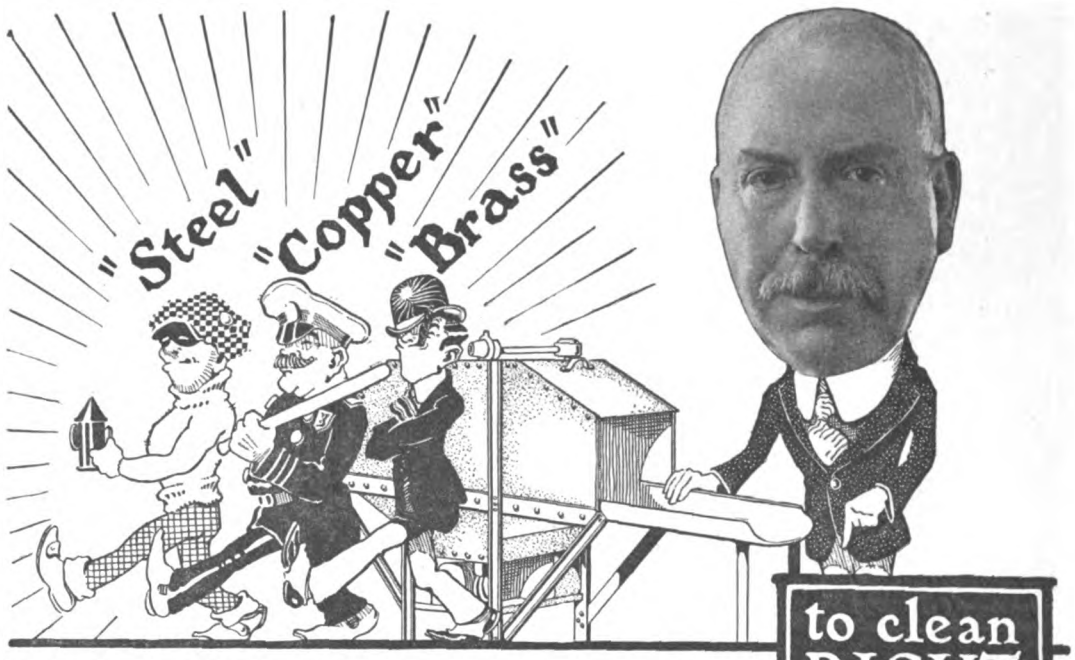
First, make a survey of the entire situation for possible necks. Consider how to get out of the old building as well as how to get into the new. In moving the educational institution, there was only one elevator. It was a rickety affair, not guaranteed to carry more than 900 lbs. In order to be on the safe side we felt it was not wise to put more than 600 lbs. on the elevator, and limited our loads to this weight. That elevator was the neck of the bottle. No matter how fast we could move elsewhere, everything was limited in its transportation by that capacity of the elevator. Should it break down during the move, everything must stop until it were fixed. Accordingly we provided for repair men to be subject to instant call. Sure enough, the elevator did break down, and we were delayed an hour. But had it not been for the preliminary survey and the consequent provision of repair men, that break down might have delayed us a whole day.

A second preliminary in planning the move is to look out for jonahs. Sometimes there is a perfectly innocent looking piece of furniture that is practically one of the fixtures. It is screwed down, connected with pipes, or complicated with electric wiring. In one case I found some bookkeeping desks wired for desk lamps. The wiring was placed in iron conduits, and the desk could not be budged until these conduits were taken down and the wires disconnected— a job of seven or eight hours for one man. In moving a bank, we had to deal with several heavyweight desks of enormous size. They would not pass through ordinary entrances. We had to build special bridges to carry them over the office partitions, and handled the removal of these safes separately as a special job in advance of the regular move.

After all the surveys have been made, the exceptions noted and cared for, the task of organizing and planning the move proper is tackled. The following outlines the order of procedure here:

1. Make complete lists of all equipment: (a) a list alphabetically by users' names, (b) a department list, and (c) a list by kinds of equipment.

2. Tag the furniture as to its disposal. Place large printed cards "DO NOT REMOVE" on the pieces to be left behind for the second-hand man. The labels on the pieces to be moved should indicate clearly for each piece its future location in the new office. In moving the bank, for example, a red tag indicated the first floor, a blue tag the second floor, a yellow tag the third floor, and a white tag the fourth floor. The number of the bay, the name of the occupant, and the number of the piece in the floor plan was marked on each tag. It took



JOHN BRIGHT cleans mineral oil from three "Hard Ones" at the same time with International Compound No. 4B at 7c a pound

to clean RIGHT ask JOHN BRIGHT

HAVE you ever tried to clean burnt-on mineral oil from steel, and buffing dirt from brass and copper in the same washing machine, at the same time? That's what I ran up against at the plant of one of the world's largest electrical corporations.

Many cleaners have been tried on this job. One tarnished the brass and copper; another would not clean the steel; another contained sediment which clogged the drains, and so on.

When I came on the job, they were using an 11 cent cleaner that contained insolubles. The steel work had to be held in the machine to get it clean. They were charging the machine with 27 pounds of this cleaner. I put in 14 pounds of INTERNATIONAL COMPOUND No. 4B at 7 cents a pound. It worked like a charm! Steel, brass and copper pieces were put through indiscriminately, and they all came out CLEAN.

INTERNATIONAL COMPOUND No. 4B saved them 2/3 their cost every time they charged the machine. Better still, it insured them consistently clean work without the objections of insolubles in their cleaner.

I'm telling you this to prove what good cleaners we make. My No. 4B suited this problem to a "T." With a line of over forty different cleaners I have one that will meet your conditions exactly. Which one will it be?

Drop me a line telling me your particular trouble. Or if you're suited, give me a chance to see if I can't save you a wad of money. If I don't satisfy you in every respect, you do not have to pay a cent for the trial lot I send you.

Why not give me a chance to back up some of my claims? Invest your two cents now!

Internationally yours
John Bright

International Products IC International Chemical Co

INTERNATIONAL CHEMICAL CO.

PHILADELPHIA ~~~~~ PENNA.

Digitized by Google

only a glance at the tag to tell by its color which floor to carry the desk to, and reference to the markings on the tag showed the bay and the position in the bay. In addition to this careful tagging of the furniture, the bays and spaces in the new building were conspicuously marked. Large cards bearing the number of the bay were suspended from the ceiling in each bay of the four floors, thus making it easy for the movers to carry a piece of furniture directly to its position as fast as delivered.

3. Draw up a definite plan of organization, showing how every man connected with the moving is to function. In moving the bank, we organized the moving company's workers into eight gangs, as follows:

Assigned to the old building

Gang 1, clear room;

Gang 2, put furniture on elevator;

Gang 3, take furniture off elevator;

Gang 4, load furniture on van.

Assigned to the new building

Gang 5, unload furniture from van;

Gang 6, load elevator;

Gang 7, unload elevator;

Gang 8, put furniture in final position.

This layout of routine provided a steady flow of the furniture from position in the old building to position in the new.

4. Draw up complete instructions for superintendents, guides, and moving gangs, these varying of course with the nature of the work. In addition to instructions to those employed directly in the moving, the employes must be instructed how to put their desks and material in condition for the move.

It is my plan to have all work stop in the office one hour before the beginning of the move. This allows ample time for each man to get his papers and other desk material in order, bundle them up in wrappers provided for this purpose, tie them up securely, and label them with his name and desk number. It is very important that this be done. Papers left in desk drawers may drop out; confusion is very likely. The moving company places emphasis on not scratching furniture, but the real danger lies in losing papers. To the eye of a laborer a valuable contract does not look any different from a casual memorandum, and a few papers dropped out of a desk mean nothing to him. The only safe way is to require that everything in a desk that is to be moved first be wrapped into a bundle, properly identified with the desk; and it is naturally easiest to make each man responsible for bundling up his own material.

Not only are the instructions written, but we personally coach the section and department heads on how to answer the innumerable questions that employes will ask. We caution them against common mishaps. One of the commonest is that of bundling inkwells, bottles of ink and of paste in with papers, or shoving inkwells into desk drawers. We warn against this every time we give instructions to a group; and yet in every move there is some fellow who bundles up the ink with other desk material and spoils a lot of papers in consequence. This error, re-

(Continued on page 53)



The Arex survey blank gives your problem the attention of specialists

INDUSTRIAL VENTILATION, unless correct, is useless. Mere installation of vents and apparatus alone is not sufficient. *Conditions* must be corrected—steam, heat, smoke, foul air or gas must be removed to make labor easier, more productive, and more profitable.

For more than fifteen years Arex engineers have been freeing industrial buildings of these profit-destroying conditions—counselling with the executives of every industry to effect savings in hundreds of branches of manufacture.

By virtue of this experience their recommendations are worthy of a confidence that busy executives appreciate, and the handy specification blank found at the lower corner of every Arex advertisement usually starts its journey at the conference table where the men congregate who are quick to realize the savings possible.

It will bring you a correct solution of *your* problem without cost or obligation. Attach a rough sketch or blue-print of the building and address Arex Company, Engineering Division, 1583 Conway Building, Chicago.

World-known leaders in every branch of manufacturing are found on the list of Arex Installations:

Carnegie Steel Company
Packard Motor Company
Bethlehem Steel Company
American Steel & Wire Company
American Car Company
Ford Motor Company
Armour and Company
Standard Textile Products Company
Studebaker Corporation
Stewart Mfg. Corporation
Semet-Solvay Company
Cadillac Motor Company
Corn Products Refining Company
Crane Company
International Harvester Company
Kelly-Springfield Tire Company
Sherwin-Williams Company
Whitney Glass Company
Pullman Company
Whiting Plover Paper Company
Gilbert Paper Company
Sinclair Refining Company
B. D. Rising Paper Company

Send rough sketch or blue-print of building with data for engineer's analysis

AREX COMPANY
J.C. Kernchen, Pres.
INDUSTRIAL VENTILATING ENGINEERS

Arex Ventilation Engineering Survey SPECIFICATION BLANK

We desire to receive *Gratis* an engineer's analysis of the following building: ..... *State character of work or business building is used for*

We are troubled with: Fumes ☐ Smoke ☐ Foul Air ☐ Heat ☐ Condensation ☐ Steam ☐

Dimensions of Building: Width .....Ft. Length .....Ft. Ceiling Height .....Ft.

Construction of Building: State whether Brick ☐ Concrete ☐ Frame ☐ Stucco ☐

Type of Roof: State whether Flat ☐ Slant ☐ Gable ☐ Sawtooth ☐ Monitor ☐

Pitch of Roof ..... State how many ..... inches to the foot .....

Location of Floor or Room to be ventilated .....

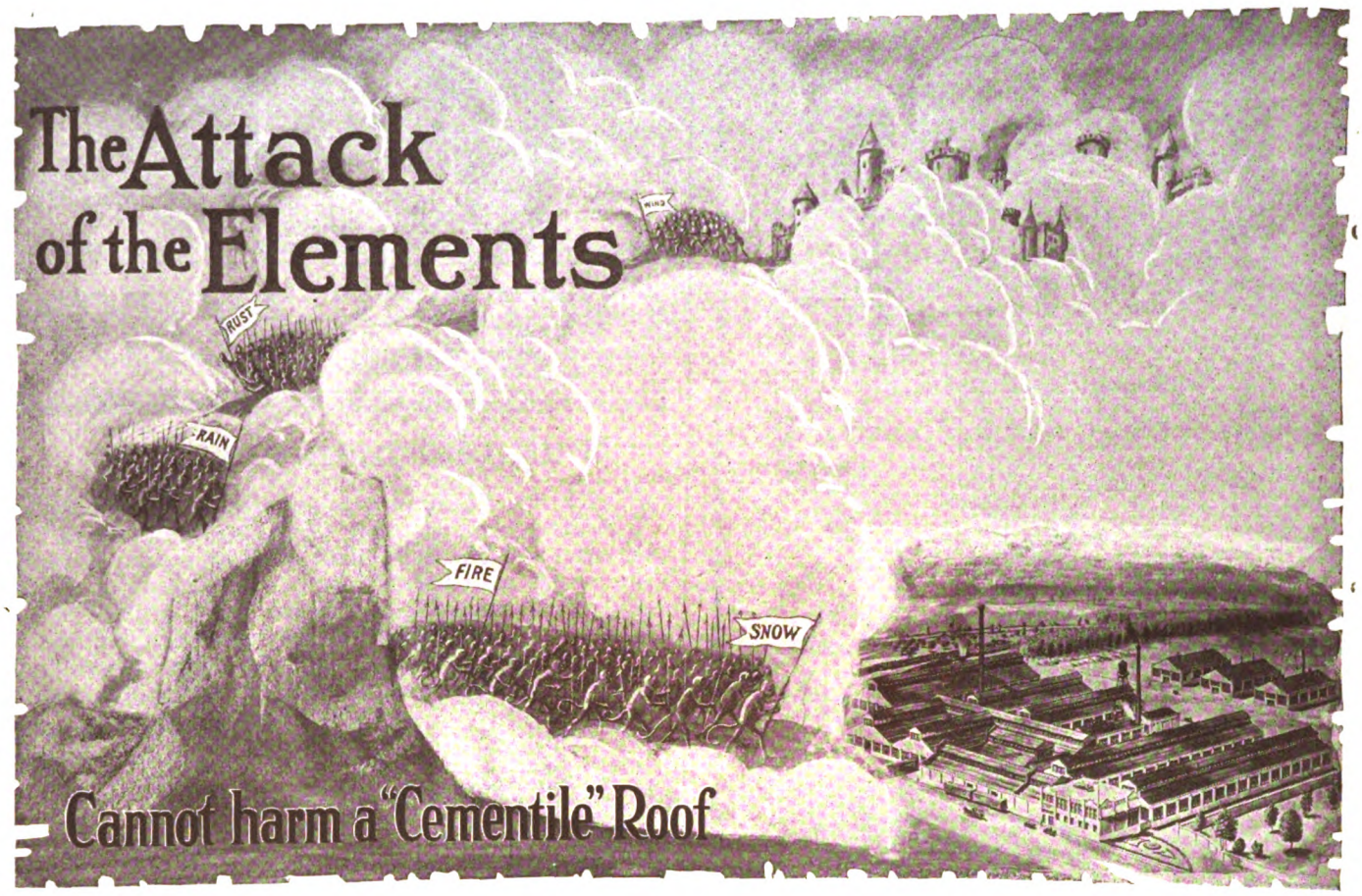
How high do adjoining Buildings extend over your Roof? .....

How many feet distant are the surrounding Buildings, or is your Building entirely unsurrounded? .....

Firm Name ..... Name of Individual ..... Title of Individual .....

Street Address ..... City ..... State .....

Digitized by Google



Here they come. No sooner is the roof finished than the army of the elements commences its attack.

Tramp, tramp, tramp. Snow, Fire, Rain, Wind, Rust, Temperature Change march forward with eager zest. It is only a matter of time before one or all of these demons effect an entrance and the roof is doomed. Constant painting and repair will but prolong its life a limited span of years.

There is only one defence against this inevitable destruction.

BONANZA "CEMENTILE"
The Big Red Tile Roofing

Concrete is the only known material that gains strength with age. A "Cementile" Roof on your building will last as long as the building endures. "Cementile" comes in slabs 26 in. x 52 in. and is adapted to both flat and pitched roofs. It is guaranteed to withstand 200 lb. per sq. foot uniform load and is impervious to fire, rain, wind or rust.

"Cementile" should be on your next building.

Write for our new beautifully illustrated book. It will show you photographs of "Cementile" installations and give working drawings for different types of construction.

Write Today

BONANZA-CEMENTILE

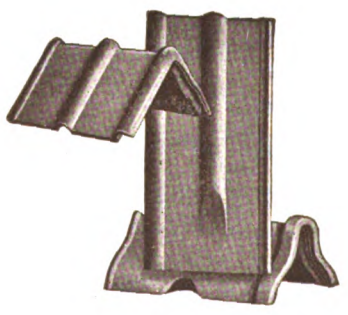
American Cement Tile Manufacturing Co.
831 Oliver Building, Pittsburgh, Pa.
PLANTS: Wampum, Pa. Lincoln, N. J. · Birmingham, Ala.
OFFICES: Pittsburgh · New York · Philadelphia · Cleveland · Birmingham

This is the first of a series of advertisements showing the destructive forces that must be avoided in building a *permanent* roof. The second will appear in an early issue.

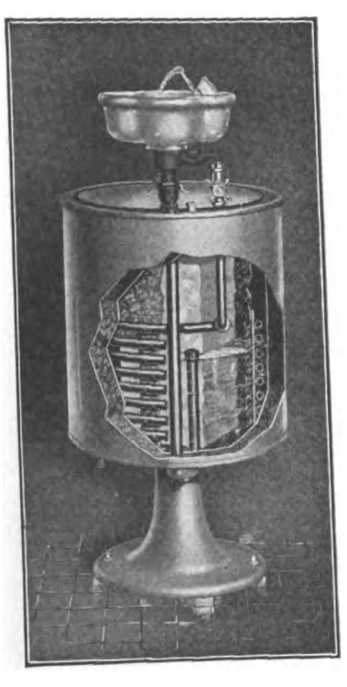
Bonanza "Cementile" is a reinforced cement tile roofing, with a pleasing outer surface, laid directly on the roof purlins. It is light, but very strong in structure, and absolutely fireproof and waterproof. Made for flat or pitched roofs, new or old.

CEMENTILE

The first cost of a Bonanza "Cementile" Roof is the last cost. We make and lay the roof, and unqualifiedly guarantee the material and labor.



Digitized by Google



If Our Figures Don't Lie You're Losing Thousands Of Dollars

Were we to tell you that thirst-quenching is costing you between $3600.00 and $6000.00 per year for each 200 men, would you believe us?

If your men are compelled to wait, *in vain*, at a water faucet for the water to cool, will they average 3 minutes per drink?

Do they average 6 drinks per day? Is their average wage as much as 30 cents per hour?

3 minutes × 6 drinks × 30c per hour = 9c per day per man
9c × 200 men × 300 days = $5400.00 per year.

Halsey Taylor Instantaneous Cooler Fountains at frequent intervals throughout your plant cut the average time per drink to less than one minute, saving several thousand dollars annually.

Result:- Improved working conditions, healthier workmen, increased production—and thousands of dollars added to your income.

Write today for 32-page catalog and prices.

THE HALSEY W. TAYLOR CO.
No. 529 Park Ave.
Warren, Ohio

BRANCHES

NEW YORK CITY
137 East 43rd Street

CHICAGO
1702 North Talman Ave.

PHILADELPHIA
5224 Greene Street

KANSAS CITY
3838 Troost Ave.

BOSTON
46 Cornhill—Room 512

SAN FRANCISCO
237 Rialto Building

HALSEY TAYLOR



CYCLONE HOISTS
HIGH SPEED

—multiply man-power.

ONE man at the easy pulling hand chain of a Cyclone Hoist will pile more stock, load and unload more material and feed more machines than a gang of men using muscle power alone,—and do it quicker and cheaper. A Cyclone Hand Hoist traveling on a system of C-M Matchless Trolleys will release scores of men from the time-consuming, hand-lifting jobs to more productive labor. It multiplies man power without multiplying the number of men on your payroll.

Our catalog explains all the mechanical superiorities of the Cyclone Hoist, the Hoist "with the Gyrating Yoke." Capable distributors in all localities can aid you in laying out material-handling and hoisting systems.

The Chisholm-Moore Mfg. Co.
Cleveland, O.

Hoists Cranes Trolleys

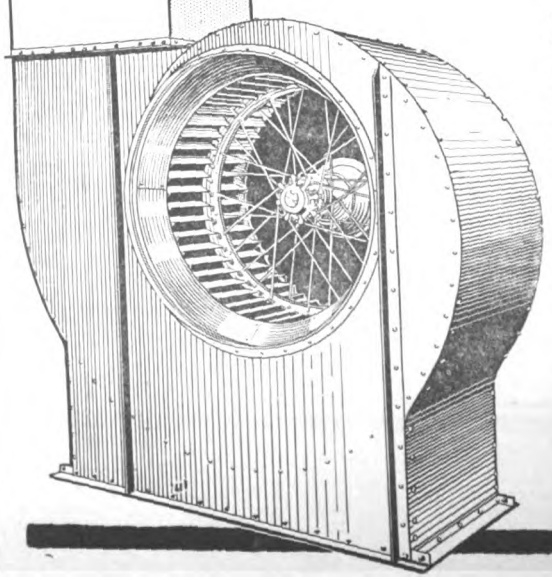
Branches: **New York, Chicago, Pittsburgh**

EFFICIENT VENTILATION

Can be obtained only through the use of equipment designed to meet the specific requirements for which it is intended.

Bayley PLEXIFORM FANS

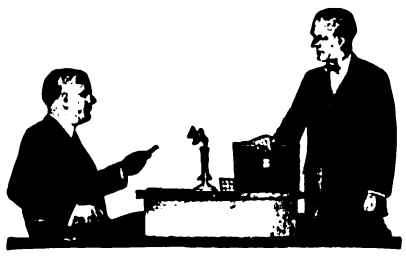
are made in a variety of capacities from 300 to 300,000 cubic feet per minute. They are designed especially with a view of handling a maximum volume of air from a minimum of space and power requirement. Their efficiency as proved by installations in thousands of the largest industrial, public, school, theatre and office buildings, makes them prime favorites with architects, engineers and owners.



Write for Catalog

BAYLEY MFG. CO.
DEPT. (P)
MILWAUKEE, WIS.

Digitized by Google



"IT'S YOUR ORDER, Because Your Company Has a PHOTOSTAT."

"This is a job where delivery is paramount. And, in every case, I have made it point to find out what kind of equipment the bidder had in order to make good his promise.

"Your Company has a piece of equipment on which I have learned to rely. I know what the PHOTOSTAT is and what it can do. I know you will not have to lose any time tracing. You can make PHOTOSTAT copies and get started on your shop work right away. In other words you'll be days ahead and I also know that there can't be any mistakes in PHOTOSTAT copies.

"Yes, sir, you tell your chief he can thank the PHOTOSTAT for this order. I know you'll make delivery with that machine to help you."

PHOTOSTAT prints cost cents. Compare this with what it costs for a draftsman to make a tracing, a stenographer to copy a page, or an artist to reproduce a layout.

The experiences of many users, written in letter form, are contained in our booklet, "A Good Word for the PHOTOSTAT." Write for your copy today.

PHOTOSTAT CORPORATION

295 STATE ST., ROCHESTER, N. Y.

88 Broad St., Boston
123 W. Madison St., Chicago
209 Leader Bldg., Cleveland
7 Dey St., New York City
510 No. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington

Executive Office: Providence, R. I.

PHOTOSTAT
Trade Mark

(*Continued from page 50*)

peated many times in my experience, shows how difficult it is to get ideas over to people.

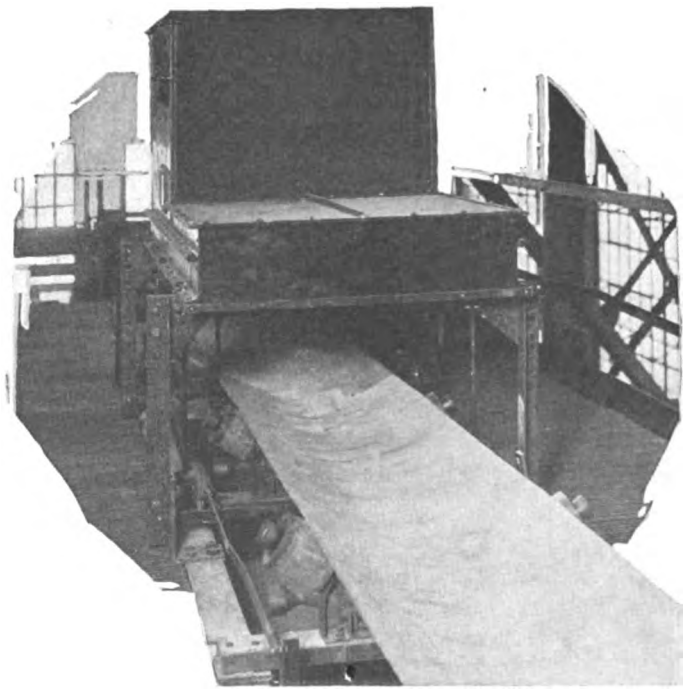
5. Handle the exceptional problems separately, usually in advance of the move. This refers to such things as extra large or extra heavy equipment, furniture that is connected with fixtures, and other exceptions—the jonahs that I mentioned earlier.

6. Schedule every step of the move. An aid to this is a large chart showing in graphic form the scheduled time for moving each department. Photostat copies of this chart may be distributed among the heads of departments and others who are to be guided by its schedules.

7. Finally, all plans and schedules having been made and all instructions given, the organization is complete, and the actual work of moving is begun. The important thing here is to follow the schedule and conform strictly to the plan throughout. Begin on schedule time and follow through the routine as laid out, for a delay or departure at one point may hold up progress all along the line. Progress involves not only getting the furniture out of the old offices expeditiously and transporting it to the new, but placing it in position in the new. The men employed as placing guides at the new building are very important in this connection. Their duty is to see that each piece of furniture is put in its final position as soon as it arrives. Each of these placing guides is in charge of a certain number of bays or a specified area of floor space in the new building, and is responsible for proper placing within his territory. He is guided by the blueprint of the floor plan, and is aided further by the chalked out spaces on the floor which indicate the exact area to be occupied by the furniture. By reference to the tags on a piece of furniture he identifies it, and reference to the floor plan shows where it goes. As fast as the furniture is put in position it is checked off on the blueprint.

Proper placing involves also the placing of the bundles of papers and desk material on the desks which they belong.

Weigh Material On the Move



With the MERRICK CONVEYOR WEIGHTOMETER

The Merrick Weightometer weighs conveyor handled material while the products are in transit. It does this without any additional handling or additional cost in time and labor.

Hundreds of concerns now check materials and products they buy and sell with the Merrick Weightometer. It is being used for various materials, such as, coal, coke, gravel, stone, cement, phosphate, fertilizer, fish, ores, etc.

No Weighman or Attendant Needed
Accuracy Guaranteed 99%

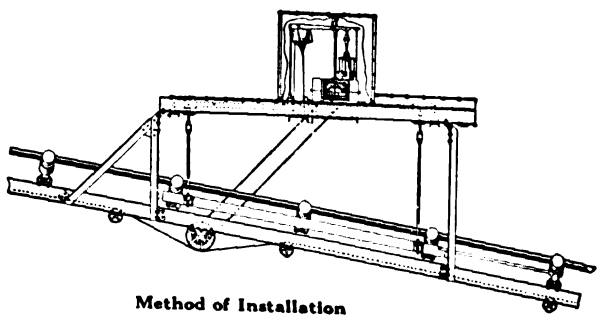
The Merrick Weightometer records the weights of materials as they are carried along on the conveyor without interrupting the flow.

The Weightometer shows you exactly how much material you receive—how much material you ship or gives a check on mill processes.

Why depend on Bill of Lading Weights?

Let us show you the money saved in labor and time with the Merrick Weightometer.

Send for "Merrick circulars" they explain in detail the advantages of the Merrick Weightometer. Write for them today.



Method of Installation

MERRICK SCALE MFG. CO.,

180 Autumn Street, PASSAIC, N. J.

Digitized by Google



"We've Been Wanting Better Brooms!"

"The old wire bound brooms we have been using don't give the service. But this RED CAP Broom looks like a REAL BROOM. I'll bet it will save us a lot of money in cleaning costs. It seems to be built RIGHT, and the guarantee shows that the maker has confidence in it. I'll order a trial dozen RED CAPS today from our jobber and test them out."

Thus one more purchasing agent finds the way to secure better cleaning results at lower cost. Ordinary brooms will not meet the strenuous demands of industrial cleaning, but RED CAP Brooms are built especially for that extraordinary service. Wherever used, RED CAPS are successful in saving time, labor and money.

That superiority is found throughout the entire line of

CAPITAL
Industrial Brooms and Brushes

"Red Cap" Brooms are built in a wide metal case, nailed from each side with wrought iron nails, with an extra metal re-inforcing band and sewed with heavy waxed twine. The materials are carefully selected corn and split bamboo, all-corn, or corn and soft, round rattan.



Each item in the line—floor brushes, push brooms, bench dusters, etc.,—is designed to meet a particular industrial need. We devote our entire facilities to making industrial cleaning equipment, and years of development have made the CAPITAL Line the best on the market.

Order from Your Jobber Under Our Guarantee

Jobbers everywhere sell CAPITAL Brooms and Brushes. Your own mill supply or hardware jobber is probably our representative. From our Catalog 17, sent on receipt of the coupon below, you can select the brooms and brushes that meet your requirements. Your jobber will furnish them under our guarantee, which permits you to return any unsatisfactory goods for full credit, carrying charges both ways paid by us.

Send for Catalog 17 Today—Use the Coupon

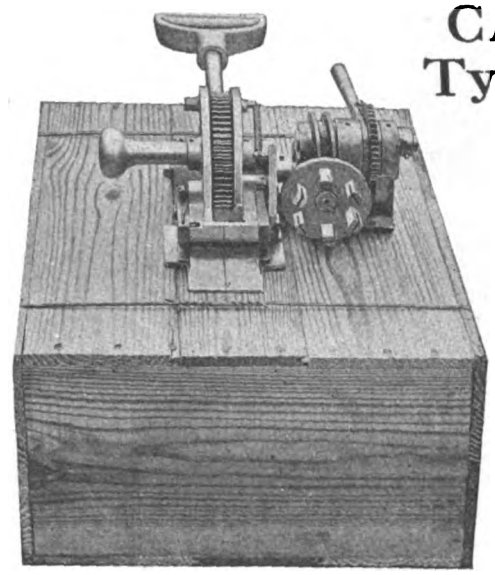
INDIANAPOLIS BRUSH & BROOM MFG. CO.
I. W. LEMAUX, President
130 Brush Street Indianapolis, Ind.

MAIL THIS COUPON

Indianapolis Brush & Broom Mfg. Co.,
130 Brush Street, Indianapolis, Ind.
Send us Catalog 17, and the name of your nearest jobber.

Name.....

Address.....



CARY'S Seal Tying Machine

The sturdiest and most efficient machine ever devised for the application of wire bands at any desired tension to all kinds of boxes, crates, etc.

Simple but Positive

in operation. Fool-proof and built to stand hard service. Weighs only 14 pounds.

The manner in which the wire is automatically sealed insures maximum strength and leaves no sharp ends to protrude and cause damage.

CARY'S Capped Bundled Wire

The wire with the patented shoulder

The Only Perfect Wire for Use in any Wire Tying Machine

A special drawn round galvanized wire in 13 and 14 gauge. The 13 gauge wire is packed in bundles containing 250 pieces; 14 gauge, 400 pieces in a bundle. Furnished in any length desired.

The patented shoulder holds the wire securely in any tying machine and absolutely prevents slipping. This is an exclusive feature.

Our method of bundling insures every wire being in perfect condition when received by you.

Prices and discounts furnished on application

CARY MANUFACTURING CO.
Manhattan Bridge Plaza Brooklyn, N. Y.

MARBLELOID
The Universal FLOORING for Modern Buildings

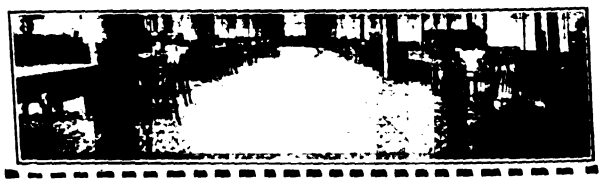
Have you in any office or industrial building a worn floor which needs renewing?

If you have such a floor, the properties of Marbleloid fireproof flooring should interest you—because it is an ideal material for re-surfacing old floors whether they are wood or concrete.

This composition flooring is laid plastic over the old floor and in a few hours you have a strong, warm, smooth-surfaced, modern floor which adds much to the appearance, serviceability and permanence of your building. This Marbleloid Floor will not dust or chip, will be found certain and elastic for walking and will not require any expensive upkeep.

We install each Marbleloid floor as well as manufacture the material and we will guarantee it to please you in attractiveness, longevity, warmth, strength and in all other qualities we claim for it. Let our engineers give you practical floor facts and send floor book. *Use handy coupon below.*

THE MARBLELOID CO., 467 Eighth Ave., N. Y.



THE MARBLELOID COMPANY, New York City: Without obligating myself in any way, please submit tentative estimates on the cost of your product installed complete for our building..... .....: below are the approximate areas involved.

Floor.....Sq. Ft. Sanitary Base.....Lineal Ft.

Wainscot.....Sq. Ft. I have checked the floor troubles we now have.

Our floors are

[ ] New Concrete [ ] Cement Finish [ ] Wood
[ ] Cracking [ ] Cold [ ] Slippery
[ ] Dusting [ ] Splintering [ ] Unsanitary
[ ] Noisy [ ] Rough [ ] Rotting

Name .....
Firm .....
Address .....
[ ] Please send 32 page Illustrated Booklet

Digitized by Google

Handling Materials in a Book Bindery

(*Continued from page 13*)

unit which is nothing more than an ingenious clamping device. The books are built into press over a heavy board, slotted at both ends; when the press is filled a top board also slotted is inserted, pressure applied, clamping rods slid into the slots, tightened, pressure released, the entire contents of press slid out on a specially designed truck and the press is ready for another filling. This cuts our actual presses and the floor space they use down to seven (from sixty) and enables us to use as many individual units as we desire without increasing the actual presses. We use over one hundred equipments now.

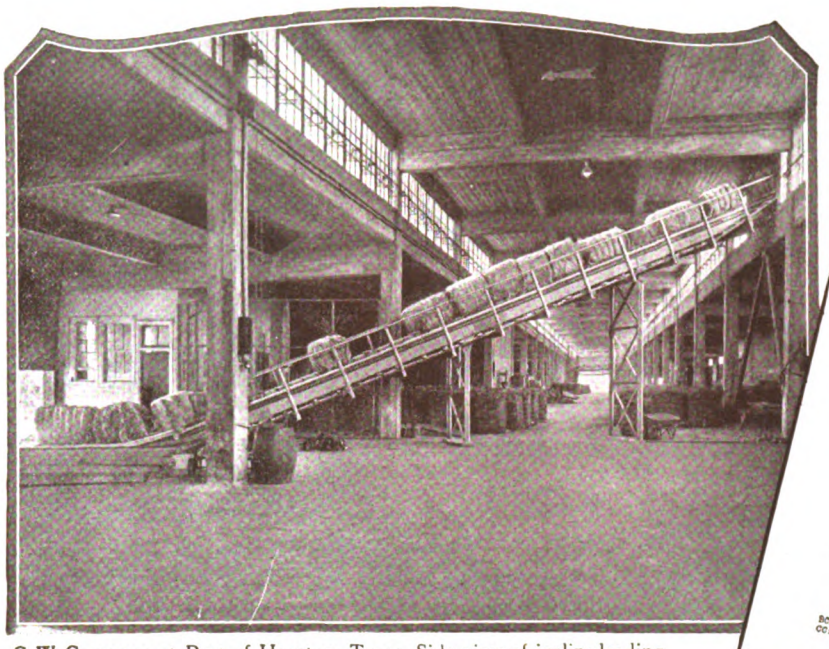
These same press trucks save a handling for they are pushed up to the examiners' tables and unloaded directly to the tables instead of first onto a platform and then onto the table. They also provide storage space and are the transporting medium for the pressing boards used between the rows of books.

The material handling problem is a serious one. Books, whether in the flat, partially worked or completed state are bulky, as a rule heavy and easily "spilled." The platform unit elevating truck principle is the logical solution of this problem in a book bindery. Few persons know that the elevating truck principle was evolved years ago in our plant and was a direct result of our efforts to solve the handling problem of book stock and flat printed matter. It is interesting to recall this now that so many different elevating trucks are available. One will be immediately struck by the simplicity of our industrial truck mechanism. The outstanding feature is the height of the platform. An employe, as determined by actual tests, can pick up or deposit a greater load at each effort eleven or fifteen inches from the floor than at six or eight.

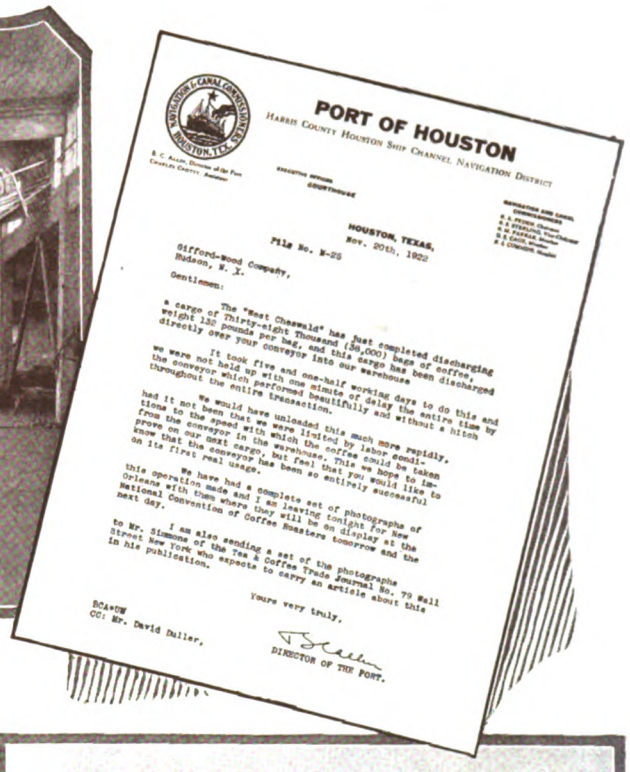
We use two units, one 26″ x 32″ for all folded signatures, gathered or otherwise completed books and heavy materials, and another 41″ x 61″ for flat printed sheets, wrapping and other paper stock. These two are standard and all our trucks fit these two platform sizes.

The efficiency of this movable platform needs no explanation. Any plant, no matter what it manufactures, that continues to pile material on the floor or use old style trucks necessitating obvious rehandling, is losing a good round profit each year and not realizing it.

Facilitating prompt, rapid handling with least effort, of incoming and outgoing shipments is another problem. By arranging our truck receiving spaces so that the truck platforms are level with the shipping floor enables us to load our trucks with these same movable platforms in many instances, saving another



G-W Conveyor at Port of Houston, Texas. Side view of incline leading from wharf to bridge spanning warehouse and wharf. 22 degree incline. Capacity—125 tons per hour.



PORT OF HOUSTON

HARRIS COUNTY HOUSTON SHIP CHANNEL NAVIGATION DISTRICT

HOUSTON, TEXAS,
File No. W-26
Nov. 20th, 1922

Gifford-Wood Company,
Hudson, N. Y.

Gentlemen:

The "West Cheswald" has just completed discharging a cargo of Thirty-eight Thousand (38,000) bags of coffee, weight 132 pounds per bag, and this cargo has been discharged directly over your conveyor into our warehouse.

It took Five and one-half working days to do this and we were not held up with one minute of delay the entire time by the conveyor which performed beautifully and without a hitch throughout the entire transaction.

We would have unloaded this much more rapidly, had it not been that we were limited by labor conditions to the speed with which the coffee could be taken from the conveyor in the warehouse. This we hope to improve on our next cargo, but feel that you would like to know that the conveyor has been so entirely successful on first real usage.

We have had a complete set of photographs of this operation made and I am leaving tonight for New Orleans with them where they will be on display at the National Convention of Coffee Roasters tomorrow and the next day.

I am also sending a set of the photographs to Mr. Simmons of the Tea & Coffee Trade Journal No. 79 Hall Street New York who expects to carry an article about this in his publication.

Yours very truly,

BCA-DW
CC: Mr. David Buller,

DIRECTOR OF THE PORT.

Gifford-Wood Conveyor Saves at Port of Houston, Texas

It replaces costly manual labor and speeds up transfer of sacked and baled goods from wharf to second floor of warehouse.

"The 'West Cheswald' has just completed discharging a cargo of 38,000 bags of coffee, weight 132 pounds per bag, and this cargo has been discharged directly over your conveyor into our warehouse.

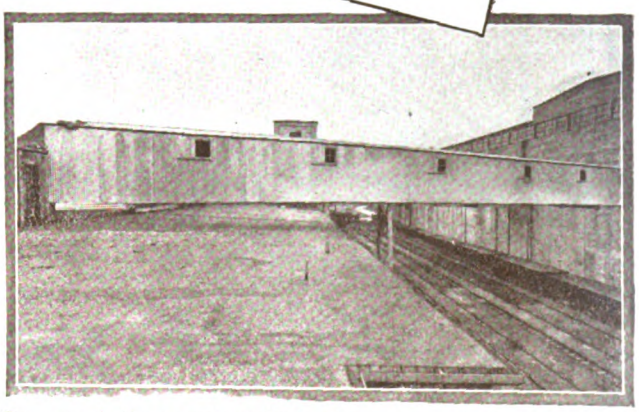
"It took five and one-half working days to do this and we were not held up with one minute of delay, the entire time by the conveyor, which performed beautifully and without a hitch throughout the entire transaction.

"We would have unloaded this much more rapidly, had it not been that we were limited by labor conditions to the speed with which the coffee could be taken from the conveyor in the warehouse. This we hope to improve on our next cargo, but feel that you would like to know that the conveyor has been so entirely successful on first real usage." (November 20th, 1922.)

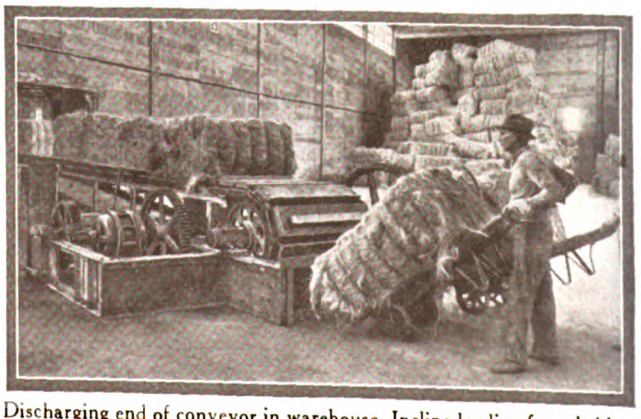
B. C. ALLIN, Director of the Port

G-W Elevating and Conveying Machinery is built for economically handling all kinds of goods and materials—sacks, bales, boxes, packages, cans, coal, ashes, etc. Write our nearest office for a G-W Catalog.

MAIN OFFICE & WORKS: HUDSON, N. Y.
New York: 50 Church St. Boston: 24 Milk Street
Chicago: 565 W. Washington St. Buffalo: Electric Building.



Conveyor bridge spanning wharf and warehouse. 120 feet long. Built of steel, with corrugated siding on top, sides, and bottom.



Discharging end of conveyor in warehouse. Incline leading from bridge. 25H. P. motor drive. Conveyor speed—60 F. P. M. Reversible.

Gifford-Wood Co. BUILT STRONGER LASTS LONGER

MATERIAL HANDLING EQUIPMENT

Digitized by Google

handling. We receive flat sheets from other plants through having similar facilities at both establishments. These truck spaces also provide garaging, and electric plug connectors from the generator room charge our electric trucks while loading, unloading, or while stored at night.

The car shipping problem is solved by a seven car siding within the building, the car floors being level with the platform. Enclosed compartments along the platform permit separating different materials or customers' property.

The by-product problem in a bindery is simple. It consists principally in selvedge rolls from book cloth which are rolled and sold by the pound to tablet, blank book, copy book and calendar manufacturers; the off-cuts of leather skins, such as sheepskin, cowhide and goat (morocco) which we work up into specialties such as card-cases, desk-pads, etc., or dispose of to pocketbook and novelty houses.

The waste problem is not so easily disposed of. Books are printed on all sorts and colors of paper. Some papers are the cheapest of wood pulp base, others have a certain percentage of rag content, while the finest papers appear seldom and in small quantities. To sell all the trimmings from these thousands of books a day (about 7,500,000 a year) as one class of material places it all in the class of the cheapest ingredients used. To sort it into all the divisions possible would be unwise because of the expense.

By keeping it in four classes, separating it by the simple expedient of providing metal waste trucks into which the operators on the different cutters throw their waste, and depositing it by means of a gravity chute from the fourth floor to the baling room in the basement into numbered trucks for each class of waste, nets us a saving of several thousand dollars a year.

A further increase in sales of fabricated structural steel is reported for February, according to figures received by the Department of Commerce through the Bureau of the Census. February sales amounted to 80 per cent. of shop capacity as against 76 per cent. for January. Total sales reported for February by 151 firms, with a shop capacity of 219,955 tons per month, amounted to 176,787 tons, the highest since last May.—*Department of Commerce.*

For photographs in this issue, not otherwise credited, we are indebted to the courtesy of the following:

CHOOSING THE ELECTRIC MOTOR FOR THE JOB
The General Electric Co.
HANDLING MATERIALS IN A BOOK BINDERY
The J. F. Tapley Co.
IS THE FIELD FOR GASOLINE TRACTORS LIMITED?
Clark Tructractor Co.
Cleveland Tractor Co.
Hellman Motor Corp.
Holt Manufacturing Co.
Hyatt Roller Bearing Co.
Reliance Trailer & Truck Co.
Towmotor Co.
PREPARATION AND BURNING OF PULVERIZED COAL
Aero Pulverizer Co.
Bonnot Co.
Fuller-Lehigh Co.
Pennsylvania Crusher Co.
AUTOMATIC LUBRICATION
S. F. Bowser & Co.
De Laval Separator Co.
Detroit Lubricator Co.
Ingersoll-Rand Co.
Lunkenheimer Co.
B. F. Sturtevant Co.
Wolf Co.
MANAGING THE MOVE
Leffingwell-Ream Co.

SAVE $1,000.00 ON YOUR LIGHT BILL

**Does your Electric Lighting Bill run $3,000 yearly?
You can lop off 1-3 of it (a cool thousand) if you will install
the nearest approach to ideal light yet devised.**

Anderson Self-Adjusting Arms for LOCALIZED LIGHTING



Anderson adjustable lighting fixture over sewing machine installation in C. G. Gunther's Son's, Furriers, N. Y.

By one movement the light can be instantly adju ted, within a fraction of an inch, to focus directly on the job—no chance for light to be wasted. It's shining with full brilliancy right where it is needed—**on the job.**

Always appreciated by the workers who can handle their tasks with less strain and in shorter periods.

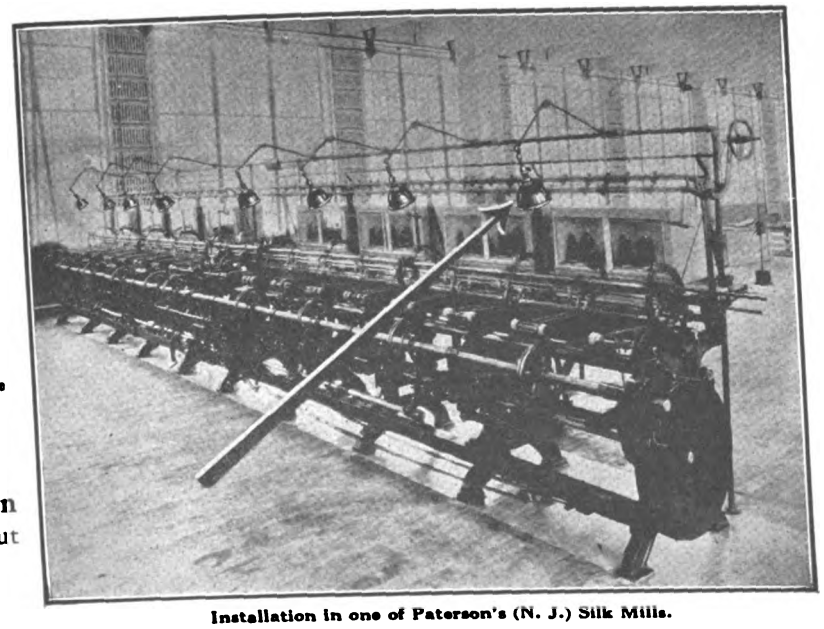
In plants where Anderson Localized Lighting system has taken the place of the antiquated methods of "lighting the whole factory to thread a needle" working efficiency has been increased 10% to 25%.

Adopted for installation in every type of industry where localized lighting is employed.

Some of our Users

General Electric Co.
C. G. Gunther's Sons
American Car and Foundry Co.
Brown Shoe Co.
American Steel Foundries Co.
Cluett Peabody & Co.
Commonwealth Edison Co.
Ingersoll Rand Co.
Lincoln Motor Co.
Studebaker Corporation
Pennsylvania System
New York Globe
Brooklyn Eagle
Philadelphia Inquiror
Brown Lipe Gear Co.
Dodge Brothers Motor Cars
Goodyear Tire and Rubber Co.
Taunton Knitting Co.
Carnegie Steel Co.
Cambria Steel Co.
Bessemer Steel Co.
Sun Ship Building Co.
Sweet-Orr Overall Co. (seven plants)
Curtis Publishing Co.
Baldwin Locomotive Works
Knox Hat Company
American Can Co. (three plants)
Savage Arms Corp.
Remington Arms Co.
Submarine Boat Co.

If you use light, use Anderson Self-adjusting Arms and cut out waste.



Installation in one of Paterson's (N. J.) Silk Mills.

A demonstration by our lighting engineer costs you nothing but the request. Send for list of plants in your direct line of business that we have already equipped.

Localized Lighting Corporation

of American Electric Equipment Co., Inc.

Room 1216 Longacre Bldg., 42nd St. & B'way., New York

Digitized by Google

Power without fuel problems

A Perfected Oil Engine for Industrial Purposes

Power production for many purposes need no longer be burdened with costly and uncontrollable coal problems. The Fulton-Diesel has proved the high economy of a perfected means to use low-grade fuel oil in internal combustion. Fuel is always available—and pipe-line, rail and truck transportation insure deliveries against interruption.

The strongest endorsement of Fulton-Diesel efficiency is found in the fact that, in many instances, the performance of one has led to the purchase of another. Side by side you find them in ice plants, flour mills, mines, cement plants, central stations, waterworks, oil pipe-line stations, etc.

The Fulton-Diesel is an American built, stationary, internal combustion oil engine, suited to a wide range of industry. It operates on one-third of the fuel required to produce equal steam power. There are no stand-by losses, no delay in starting, no ash removal expense. Labor is reduced to one engineer. The whole cycle of power generation is in the single unit—saving investment in boilers, stacks and other steam plant auxiliaries.

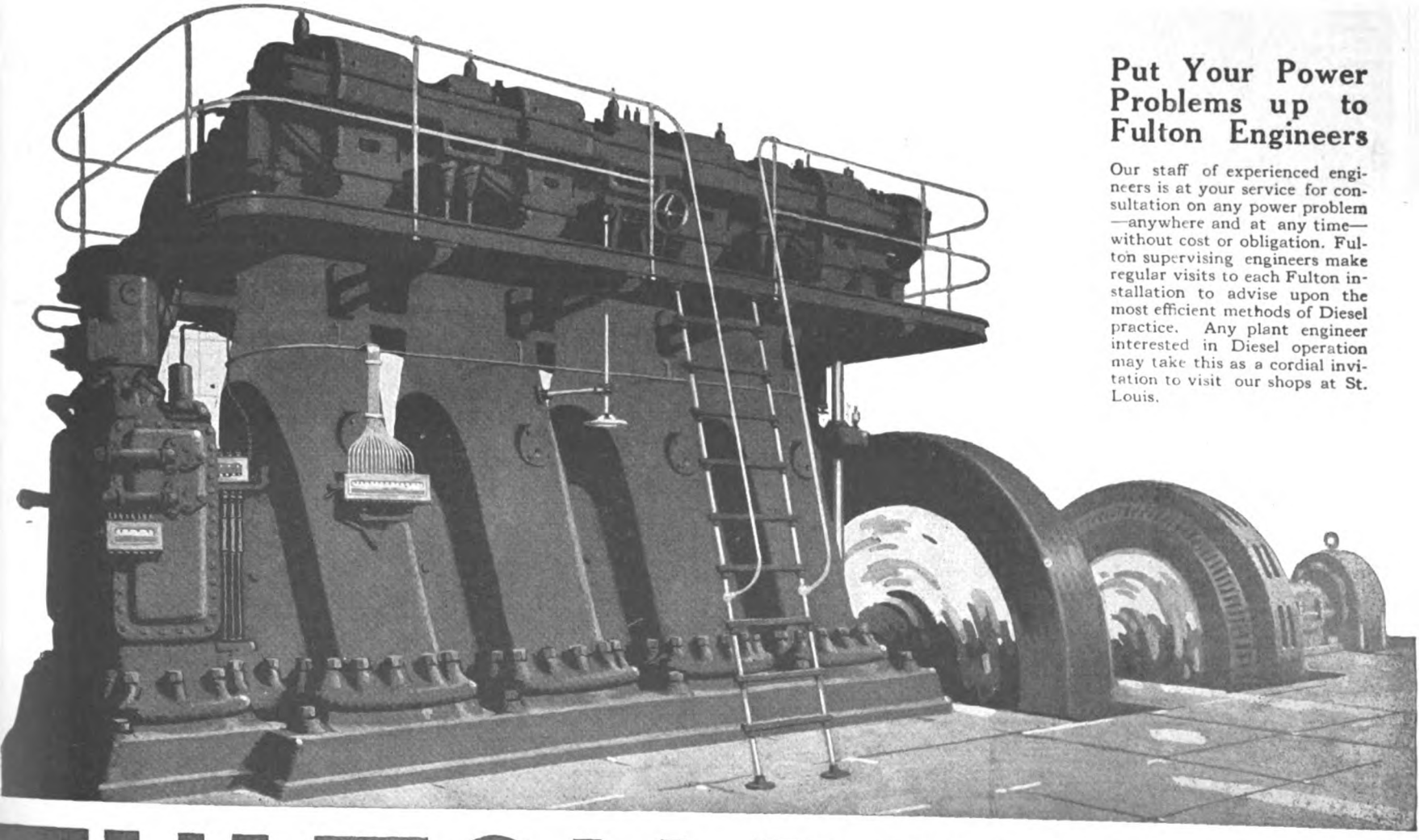
The Fulton-Diesel is a product of 70 years successful engine building. By its mechanical efficiency it achieves the highest degree of power economy yet developed in a prime mover, through the elimination of so many factors contributing to power waste.

The story of the Fulton-Diesel is one of the most important before American industry today. You only have to ask for us to send you—free and postpaid—a copy of our carefully written and fully illustrated booklet, describing the Fulton-Diesel in detail.

FULTON IRON WORKS COMPANY, ST. LOUIS, U. S. A.

Successful Engine Builders for 70 years

Branch Offices: New York - 82 Wall St. Dallas, Texas - Praetorian Bldg. New Orleans - Hibernia Bank Bldg. Havana, Cuba - 402-403 Banco Nacional



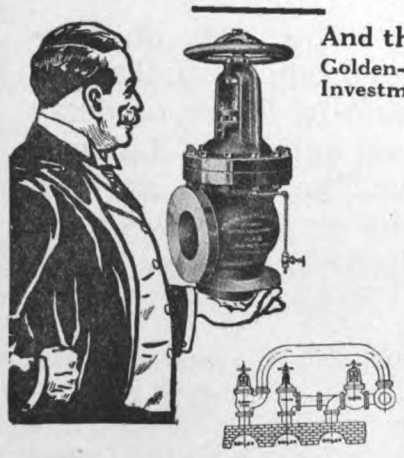
Put Your Power Problems up to Fulton Engineers

Our staff of experienced engineers is at your service for consultation on any power problem—anywhere and at any time—without cost or obligation. Fulton supervising engineers make regular visits to each Fulton installation to advise upon the most efficient methods of Diesel practice. Any plant engineer interested in Diesel operation may take this as a cordial invitation to visit our shops at St. Louis.

FULTON DIESEL

Digitized by Google

Why did the large Steel Corps. Install 4100 GOLDEN ANDERSON Life and Property Insurance Valves? "There Must Be a Good Reason"



And there certainly is

Golden-Anderson Valves are a Gilt-edged Investment in safety.

"No Shut-Down When a Boiler Tube Ruptures"

"No Explosion When a Steam Pipe Bursts"

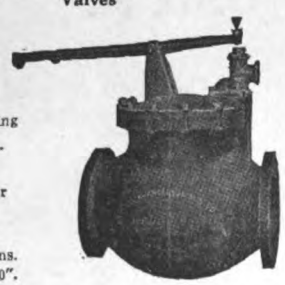
DOUBLE EXTRA HEAVY VALVES

"Every Valve sold with a Positive Guarantee."

1. They will cut off a boiler instantly when a boiler tube bursts.
2. They will prevent live steam from entering a cold boiler, thus insuring safety to workmen.
3. They instantly shut off the steam from all boilers when a pipe breaks.
4. They can be opened or closed by hand in the same manner as ordinary gate or globe valves when fitted with the patented safety latch.
5. Double cushioning prevents absolutely all pounding or chattering.
6. Automatically equalize the pressure between all boilers.
7. Are equipped with double Corliss Dash Pot that cushions it opening and closing.
8. Cannot pound, spin, stick or chatter.
9. Every valve sold with a positive guarantee.
10. Safeguard the men and safeguard the property.

GOLDEN-ANDERSON

Pat. Automatic Cushioned Stand Pipe Valves



Especially adapted for coke quenching

No metal-to-metal seats

Air and water cushioned

Angle and Globe patterns. Sizes 3" to 30".

GOLDEN-ANDERSON

Cushioned Electric Water Service Valves For Fire Service



No waste of current as it is only on solenoid a few seconds on either opening or closing of valve.

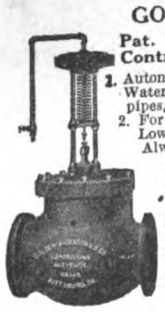
May be closed and opened from remote points electrically; also hand operated.

Air and water cushioned. No metal-to-metal seats. Virtually indestructible.

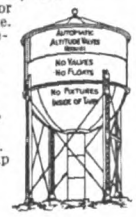
Sizes to 30 in.

GOLDEN-ANDERSON

Pat. Cushioned Automatic Controlling Altitude Valves



1. Automatically Maintain uniform Water Levels in Tanks, Standpipes, Reservoirs, etc.
2. For High or Low Pressure. Always Dependable. 3. No Floats or Fixtures used. 4. No Water Hammer or Shocks. 5. Sizes up to 30 in.



GOLDEN-ANDERSON

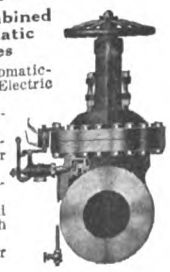
Pat. Automatic Cushioned Water Pressure Regulating Valves



1. Maintain a constant reduced pressure regardless of fluctuations on high pressure side.
2. Perfectly Cushioned by water and air. No metal-to-metal seats.
3. The best valve made for maintaining a constant low pressure where consumption is continuous.
4. Operates quickly or slowly as required—No attention necessary.
5. Positively no hammering or sticking. Sizes to 24 in.

GOLDEN-ANDERSON

Pat. Cushioned Combined Throttle and Automatic Engine Stop Valves



1. Operate 3 ways: Automatically, by Hand, or by Electric Switch.
2. Prevent Fly-wheel Explosions.
3. "Double Corliss" Cushioned—No Pounding or Sticking.
4. Contains No Tight Fitting Parts.
5. Furnished in Angle and Globe Patterns for High or Low Pressures.
6. "Always Ready for Service."

GOLDEN-ANDERSON

Patent Automatic High and Low Pressure Steam Traps



1. The first new departure in steam trap design in years.
2. 50 to 100% greater capacity than other traps of similar size.
3. Full area through discharge valve.
4. Extra Heavy Throughout — Very Durable — Will last a lifetime — and **Always Works.**
5. Furnished Semi-Steel and Cast Steel for Superheat.

GOLDEN-ANDERSON

Pat. Automatic Cushioned Steam Pressure Reducing Valves



1. Maintain a constant reduced pressure.
2. Thoroughly cushioned.
3. No hammering, chattering or sticking.
4. No auxiliary valves or small by-passes to clog up.
5. No wire drawing.
6. Only one adjustment from the outside.
7. Double extra heavy throughout—practically indestructible.

GOLDEN-ANDERSON

Pat. Automatic Double Cushioned Check Valves



1. Especially adapted for Water Service.
2. For High or Low Pressure.
3. Thoroughly Cushioned. No chattering, Hammering, or sticking.
4. Globe or Angle Patterns up to 30 in.
5. Especially adapted for hydraulic elevator service.

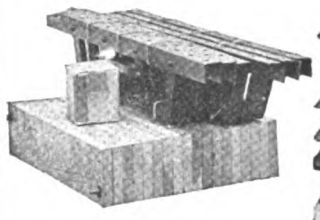
Golden-Anderson Valve Specialty Co.
1306 Fulton Building , Pa.





At Right:—An Enterprise Platform loaded with 5000 pounds of pig iron.

Below:—Three Enterprise Platforms ready for shipment, showing why they take a class three freight rating.



Shipped Anywhere at Low Cost

Enterprise Platforms can be shipped anywhere at an exceptionally low cost. They come to you knocked down—take a class three freight rating, which means a substantial saving on the shipping cost. But everything is complete, and easily assembled in a few minutes. Necessary bolts, nuts and lock washers are supplied. Top boards finished on four sides, cut to length, bored and countersunk for bolts.

Made in all Sizes

If you will give us the following information we will quote you promptly on a platform to meet your requirements.

Measurements Desired

Length of top over all.....
Width of top over all.....
Clearance between runners....
Style elevating truck used ....
Height of truck base when lowered .....



Carry Heaviest Loads

ENTERPRISE PLATFORMS wont break down under heavy loads like the all-wood platforms you make. The combination wood and steel construction of Enterprise Platforms makes them so strong and durable that they carry the heaviest loads—practically eliminate the expense of repairs or replacements—and last indefinitely. Enterprise Platforms are built *so strong*, and they cost *so little*, you can't buy or make platforms of equal strength and durability for less money. Send measurements and get descriptive literature and prices.

ENTERPRISE IRON WORKS
1156 E. 24th St. **Indianapolis, Ind.**

ENTERPRISE PLATFORMS For Elevating Trucks -Hand or Electric

Digitized by Google

Choosing the Electric Motor for the Job

(*Continued from page 11*)

ccelerate heavy loads.

Next to the shunt motor in daptability for driving varibus types of machines and other industrial drives, is the ompound motor. This motor, as its name implies, is a combination of the shunt motor and the series motor. It has two field windings, one shunt and the other series, which give it the high torque characteristics to a certain degree, of the series motor. As a matter of fact, it may be said to combine the good features of both. This type of motor is employed very extensively in shop practice, for driving punch presses, bending rolls, and metal forming machinery in general. It is also used in rolling mills for auxiliary drives, on elevators, and in other places where intermittent high torque service and safe, light load speeds are required.

A good example of compound motor drive is that of the belted metal planer. The duty cycle of planers requires frequent and rapid reversals, with the motor overloaded at the instant of reversal, and the speed must remain fairly constant under load conditions. The load is usually applied very suddenly on the "cut stroke," and is as suddenly removed.

Alternating current as a form of power supply has been more widely used than direct current for industrial purposes. There are, with alternating current, factors affecting the correct choice of types of motors for a given work that do not exist with direct current. The most important of these from the standpoint of operating economy, at least, is power factor. This has assumed added importance because of the growing tendency of central stations to include penalty bonus clauses in their power contracts. In other words, the factory with poor power factor conditions pays more for a given amount of power at the meter than one where the power factor is good. How advantage can be taken of this situation by the selection and application of the various alternating current motors will be seen from a consideration of their characteristics.

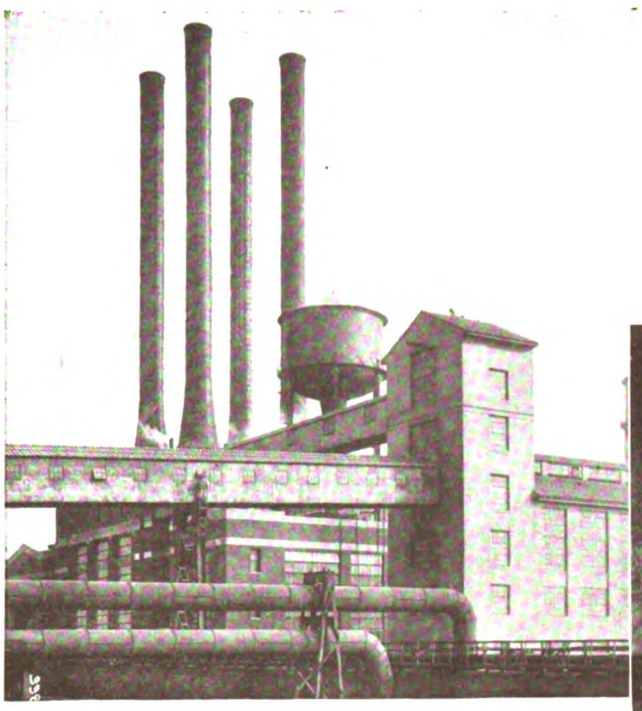
Of the three types of alternating current motors, induction, synchronous and series, the induction motor is the most popular. The induction motor class is divided, according to the certain operating principles of the motors themselves, into squirrel cage motors and wound rotor motors. Each of these has characteristics as to speed, torque and efficiency peculiar to itself.

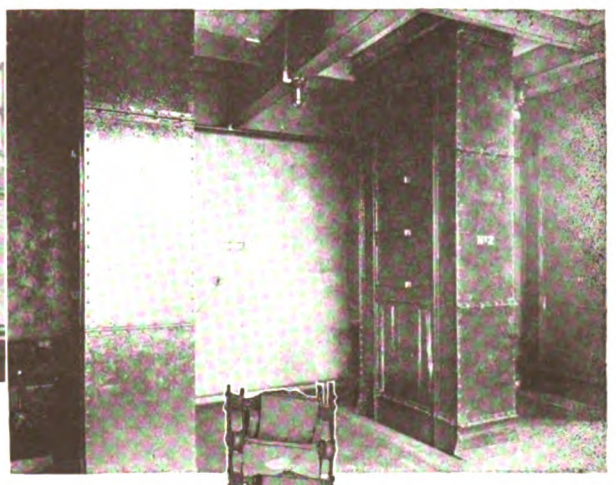
The rotation of the induction motor is brought about by shifting of the magnetic field produced in the stator winding, which as it shifts, drags the rotor around with it. The speed is therefore dependent on the frequency of the current supply. The squirrel cage motor has a relatively low

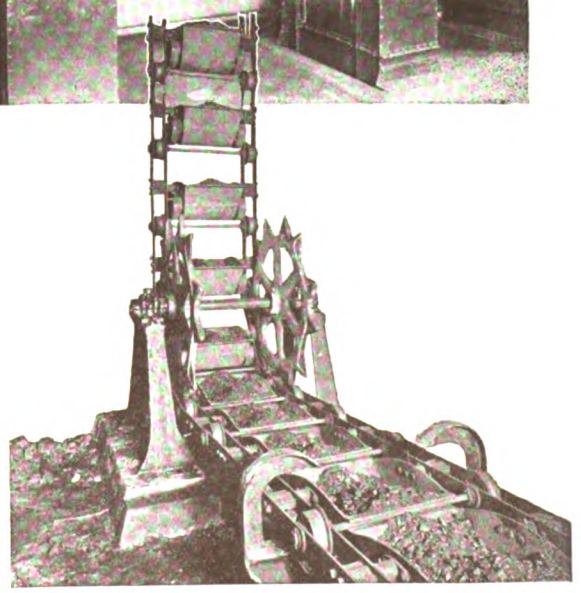
(*Continued on page 61*)

In the Coal Pulverizing Plant at River Rouge

Jeffrey Pivoted Bucket Elevator Conveyor







The economy and efficient performance of Jeffrey Conveying Equipment is very evident at the Ford River Rouge Plant.

Here in the pulverizer building 250 tons of coal per hour are ground into boiler fuel. It is then conveyed through the pulverizer building up to the tower by a Jeffrey Pivoted Bucket Carrier on to the cross conveyors into the boiler room.

In the Ford Plant and in hundreds of industrial power plants Jeffrey Equipments are important factors in lowering the cost of generating power.

Our Engineering experts are at your service and will gladly assist you in the selection of equipment applicable to your requirements. Send for our catalog, No.345. It will help you towards lower power plant costs.

Jeffrey Mfg. Co.,
946-99 North Fourth Street,
Columbus, Ohio.

JEFFREY
MATERIAL HANDLING MACHINERY

Digitized by Google

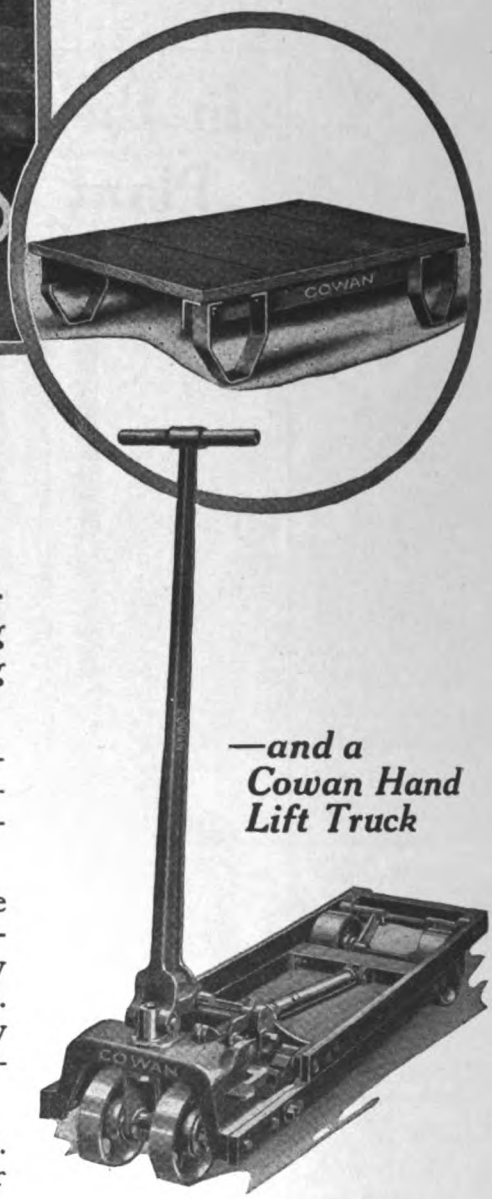
ELIMINATE REHANDLING



He runs the Cowan Hand Lift Truck under the loaded skid and with a single downward sweep of the handle elevates the truck platform, quickly and easily picking up the skid and its load. At destination, he steps on the foot pedal and skid and load are quickly and gently lowered to the floor.

No loading and unloading by hand—wasteful in time, labor and money. No truck delay. *One* man instead of a gang.

Cowan Skid Platforms for Your Loads



—and a Cowan Hand Lift Truck

HOW many times are your goods and materials loaded and unloaded by hand in moving them from point to point? Each rehandling wastes time, labor, and money.

The Cowan Hand Lift Truck and Skid System has eliminated costly rehandling and greatly reduced truck equipment investment and maintenance for thousands in practically every line of business.

One man and a *single* Cowan Hand Lift Truck often serve as many as fifty to one hundred skid platforms—duplicating the work of an extensive equipment of ordinary trucks and the force of men necessary to handle them. Cowan Long-Life Skid Platforms are strong, sturdy, simply constructed, and inexpensive. Their maintenance is practically negligible.

Eliminate rehandling. Send for a Cowan System expert. Without obligating you in any way he will analyze your material handling problem and fully explain how the Cowan System can reduce your material handling costs. Or write, briefly describing the materials you handle, and we will gladly mail information pertinent to your particular business.

The Cowan System includes Cowan Hand Lift Trucks, Long Life Skids, Electric Lift Trucks, Electric Load Carrying Trucks, and Electric Tractors—used individually or in combination.

COWAN TRUCK CO., 6 WATER ST., HOLYOKE, MASS.

New York Office: Grand Central Palace. Offices in Principal Cities

Largest manufacturers of complete Hand and Electric Industrial Truck Systems.

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

Digitized by Google

(*Continued from page 59*)

starting torque, and draws a heavy starting current from the line. Ordinarily it is used for drives where the duty cycle calls for a constant speed and infrequent starting. Such applications as certain small machine tools that run continuously, fans, blowers, etc., are good examples. Since there is no mechanical or electrical connection between the stator and the rotor, and consequently no sliding parts to cause sparks, this motor is adapted for the use in places where fire hazard from dust or fumes in the surrounding atmosphere is to be considered—in flour mills, for example. A form of squirrel cage motor known as the "cast rotor" type has been developed, which has been applied very successfully to wood working machinery, and other places where a very high constant speed is desired. Motors have been built for this work that develop speeds as high as 25,000 R. P. M. It is possible to fit an induction motor of some sort to almost any kind of work.

In another form, known as the multi-speed type, the speed is changed by altering the number of poles in the primary, or stator. Such motors are used in sizes up to 4,000 HP for driving mills in steel plants, for propellor drives on electrically driven battleships, and industrially for all sorts of machine tools, line shafts, textile machinery, rubber mill machinery, etc.

The wound rotor or slip ring induction motor has a large field of application, owing to its high starting torque. In fact, this motor corresponds in characteristics and field of application to the compound wound direct current motor. It may be built for variable speeds. In variable speed motors the speed is changed by altering the resistance in the secondary or rotor circuit. Like the D. C. compound or series motors, the speed obtained with resistance in the rotor circuit depends on the load, and it is not considered good practice to operate at less than 50 per cent speed with full load torque.

Care must be used, however, in selecting the motor or motors for any particular drive, whether group or individual, because of their power factor characteristics. The induction motor, when operated at partial load, has a very poor power factor, and a number of them on the lines of a factory will adversely affect the overall power factor. This feature can be overcome, in the case of group drive, by so apportioning the duty of the individual machines in the group that a motor of such horsepower can be used that it will run at the point in its load curve that insures the best power factor. This usually means between ¾ and full load. In the case of individual drive, the motor should be selected so that its horsepower is sufficient to meet ordinary demands of the driven machine and shut down when the machine is not in operation, which will insure a good load and power factor. In other words, "overpowering" the machines should be avoided.

The synchronous motor, because of its high power factor, has received increasing attention from engineers and large

(*Continued on page 63*)

SKF



Deep-Groove Ball Bearings

Easily Withstand Exacting Duty on Pumps

LOCATED far away from industrial centers and in localities difficult of access, oil-well pumps must be kept in operation despite possible neglect and the inability to obtain prompt repair service.

Most of the responsibility of protecting pumps from breakdown, falls upon the bearings which must accept the heavy radial and thrust loads without developing any radial or axial play that would endanger the rotating members.

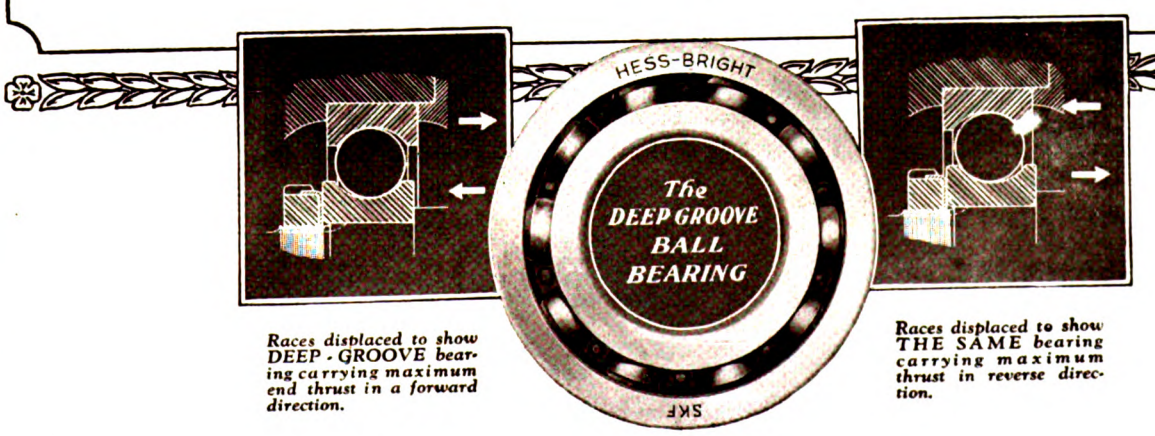
Deep-groove ball bearings made by the Hess-Bright Manufacturing Company shoulder this responsibility with ease for, unlike sleeve types of bearings, they develop no appreciable wear in service. Furthermore, they take heavy thrust loads in combination with radial loads and thus eliminate the common difficulties experienced with step thrust bearings.

Because of these advantages ball bearings have met with wide adoption on not only oil-well, cargo, fire-fighting and city water supply pumps but on all classes of machinery containing rotating elements.

THE HESS-BRIGHT MANUFACTURING COMPANY

Supervised by SKF INDUSTRIES, INC., 165 Broadway, New York City

921



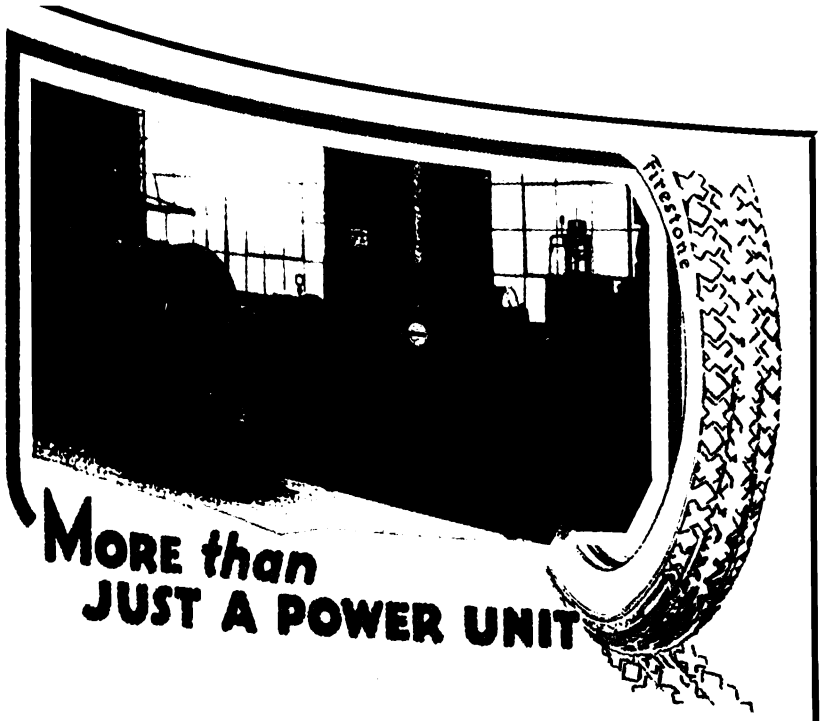
Races displaced to show DEEP-GROOVE bearing carrying maximum end thrust in a forward direction.

Races displaced to show THE SAME bearing carrying maximum thrust in reverse direction.

BALL BEARINGS

The Highest Expression of the Bearing Principle

Digitized by Google



MORE than JUST A POWER UNIT

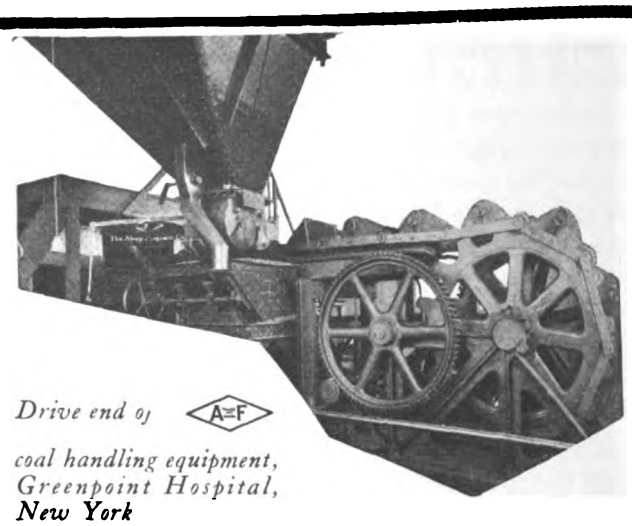
It is a power extracting reducing valve, a heat balance regulator with a "brain" all its own, furnishing always the exact amount of exhaust steam required for heating, and last, but most important, a paying investment earning as much as two hundred dollars a day.

THE Firestone Metal Products Co. in Akron, Ohio, had a problem no different from many other plants, but they solved it in a different way. Low pressure steam was required for heating in such varying quantities that a reducing valve would have been the usual solution. But they installed a highly efficient 1000 H. P. four-stage Terry turbo-generator unit. This not only gave them the desired pressure reduction but also extracted the power from the pressure drop. As the demand for the exhaust steam varied it was necessary to apply a regulating device to the turbine which would cause it to take only enough load to furnish the desired amount. This regulator operates automatically and does not require the attention of the operator. During the normal heating period this unit effects tremendous savings. The engineers of the Firestone Company estimated that the savings would reach as high as two hundred dollars a day when the temperature was ten degrees above zero or lower. Better write for Bulletin SM-25 and get in touch with a Terry engineer. He may be the means of suggesting similar savings in your plant by the application of

The TERRY TURBINE

SEE TELEPHONE DIRECTORY FOR OFFICE ADDRESS IN YOUR CITY

THE TERRY STEAM TURBINE CO.
TERRY SOMERS
HARTFORD



Drive end of A-F *coal handling equipment, Greenpoint Hospital, New York*

POWER CAN WAIT FOR NO MAN

Too much depends upon the modern power plant to take the slightest chance upon a lapse of service. Supplies of fuel must be constant and assured. Adequate provision for the removal of ashes is equally important.

A-F CONVEYORS A-F

are fundamental considerations in power plant equipment.

A-F Elevating, conveying and transmission machinery is made to meet particular requirements in individual plants. With clock-like precision it accomplishes industrial feats impossible by men, in places and under conditions which men could not endure—swiftly and economically.

We invite you to consult the A-F Engineering Service Bureau. Our engineers are prepared to study your particular problems in order to devise the most efficient and economical conveying facilities for your plant. A preliminary report will place you under no obligation.

THE ALVEY-FERGUSON COMPANY
Incorporated
CINCINNATI, OHIO

Digitized by Google

(*Continued from page 61*)

power users as a remedy for the conditions created by a large induction motor load. The motor obtains its name from the fact that it runs at the same speed, pole for pole, with the machine generating its power supply. Its speed is constant, being determined by the number of poles and the frequency of the applied voltage.

The synchronous motor will not accelerate a heavy load, and if such a load comes on suddenly while it is operating, it may be pulled "out of step" and drop its load; nor will it come back of itself if the load is removed. These disadvantages have been met by the use of clutches of one sort or another between the motor and its load but which provided a very unsatisfactory solution at best. The synchronous motor can, however, be arranged to furnish leading current to correct the lagging current produced by ordinary induction motors. Since lagging current produces a poor power factor, these machines will raise the power factor of a system and it is customary to use them to drive some machine requiring constant speed, such as a blower, because they will develop a certain amount of work while correcting the power factor.

Recently a new type of synchronous motor has been developed that can be directly connected to the driven machine without any clutch between, and which is entirely free from the poor pull-in torque characteristics of the ordinary synchronous motor. The design and operating characteristics of the new motor are sufficiently interesting to warrant description. Briefly, the frame is free to revolve, except when held by a brake of the type used on mine hoist equipments. In starting, the brake is released and current admitted to the revolving armature bringing it up to speed regardless of the load. The field, or rotor, is held stationary by the friction of the load. When the armature is up to speed, current is admitted to the field and the brake is applied gradually to the amature frame. As the latter slows down the rotor and the load comes up to speed until, with the armature locked stationary, the motor is functioning as an ordinary synchronous motor. The motor will develop a torque of from 150 to 200 per cent of normal throughout the starting period, and its acceleration is so smooth that no clutches are necessary, nor is the driven machine subject to shocks.

This motor opens up, by removing the limitations hitherto imposed on synchronous motors, a wide field of application, and a much greater opportunity for power users to take advantage of the corrective power features of the synchronous motor. Until now, the use of synchronous motors has been confined largely to constant speed, constant load machines that do not require excessive starting torque. Examples of this type of machine are compressors, centrifugal pumps and blowers, for driving motor-generator sets, and similar work. The motors have been used also in driving other machinery, especially for direct connected group drives, or line shafts, where the load de-



Lewis-Shepard Stacker
The Perfect Portable Elevator
—for piling and storing goods and materials, ceiling high. Conserves space, protects materials, saves two or more men. Made in three types:
(1) Hand Operated. (2) Combination, Hand and Electric. (3) Heavy Duty (Power) with enclosed gears,—worm drive; the most compact stacker ever made. **Best design of its kind on the market.**
New Circular just off the Press. Write today.

—engaged in handling and rehandling goods and materials,—usually in cumbersome, antiquated fashion. These conditions form one of the main sources of the rapidly rising tide of Labor Wastage,—a waste not only appalling but unnecessary because the adoption of the best modern handling equipment turns a large part of the present labor overhead into actual profits. Twenty-four concerns, using handling equipment made by the Lewis-Shepard Company of Boston, Mass., increased their yearly profits over $59,000. In the light of present day conditions the conversion of such useless debit into real credit becomes prophetic. For we must remember that Live facts show conclusively that Labor Costs are and will continue increasingly to be the most expensive item of production in American Industry.

"Cheap Labor" Is Costly Labor!
Unless It Works With Proper Tools

Picture the thousands on thousands who must daily push, shove, haul and lift at heavy, bulky or fragile loads. Investigation shows that 20 to 50% of the Cost of Labor is confined in many concerns to this kind of so-called "Cheap Labor." Picture the tremendous overhead rolled up by this army of unskilled handlers. Roughly compute the enormous waste! Two to four out of every five could be released for other service by the simple and inexpensive adoption of Lewis-Shepard Handling Equipment, the only logical solution of this part of the "High Cost of Labor" Problem.

Lewis-Shepard Handling Equipment
Saves Man Power and Money

by the simple but effective method of giving labor the most efficient tools to work with,—thus eliminating useless effort and slack schedules.

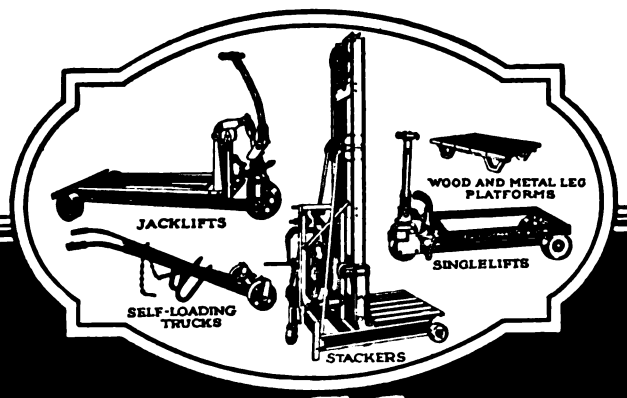
Jacklift Trucks, 2,500 to 8,000 lbs. Singlelift Trucks for Lighter Loads. Wood and Metal Leg Platforms. Self-Loading Barrel and Case Trucks. The Lewis-Shepard Stackers.

Lewis-Shepard Handling Equipment
We Guarantee Results from Our Equipment Before You Pay

50% New Business from Old Customers proves that NEW Opportunities for Saving follow the installation of Lewis-Shepard Handling Equipment. Not expensive. Over 4000 customers in past eight years.
If you would cut down the overhead of useless work,—if you would turn this overhead into actual profits,—investigate Lewis-Shepard Handling Equipment at once.

Send for Our Free Illustrated Booklet
"24 Users Increase Profits $59,565.88 Yearly"

Write us today
at our Factory Address
Lewis-Shepard Co.
582 E. First St.
Boston, Mass.



Write us today
at our Factory Address
Lewis-Shepard Co.
582 E. First St.
Boston, Mass.

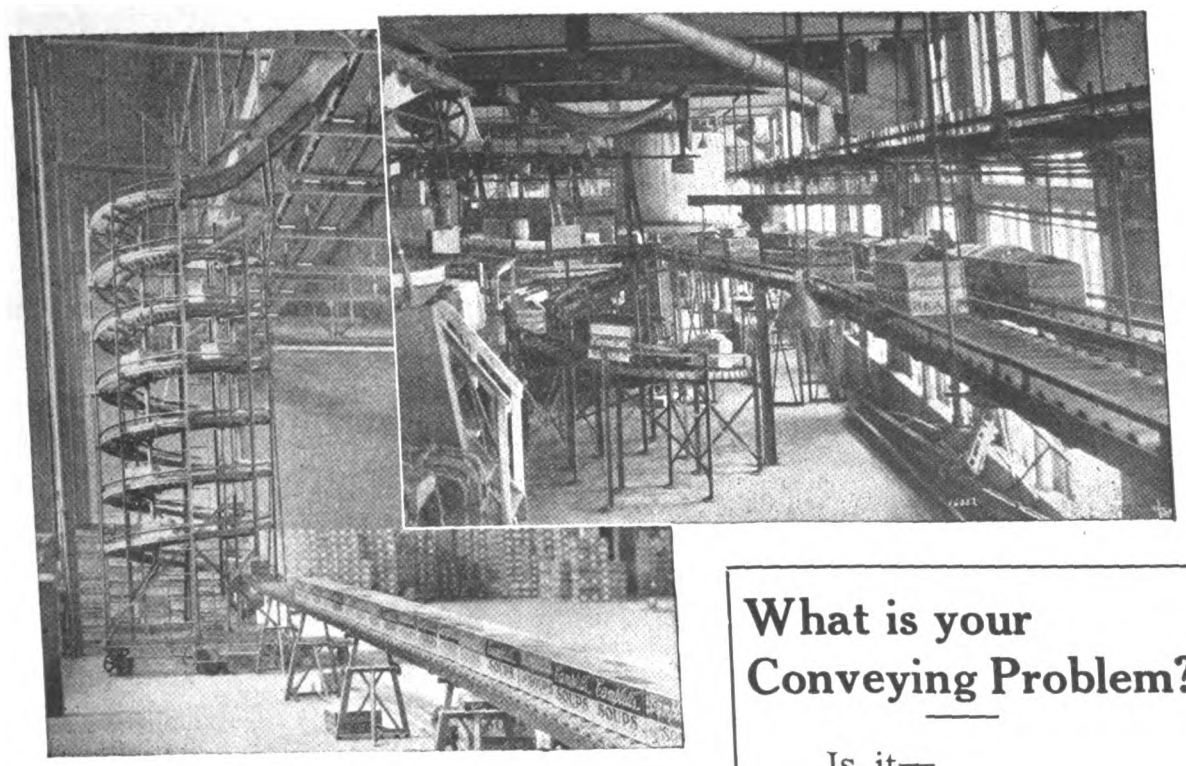
Lewis-Shepard
BOSTON

Digitized by Google

mands can be so arranged that excessive starting torque is not required, and peaks that are liable to pull the motor out of step are not encountered. The new motor is not only applicable for this sort of work, but for other cases, where slow speed machinery requiring a high starting torque is to be driven. An example of the latter to which the new motor has been applied is the ball and tube mill used in cement manufacture. It is not too much to predict that the new synchronous motor will in time replace the induction motor in many more cases where the former type of synchronous motor was barred by its limitations.

The series or commutator rotor is analogous to the direct current series motor and its greatest field so far seems to be for single phase work, probably because the slipring, or wound rotor induction motor is only built for polyphase circuits. It is mostly used to drive fans, where the load at the various speeds is practically constant. Speed reduction is obtained by the use of resistance in the circuit.

Let Mechanical Handling Take the Place of Immigration Loss.



Come to

Package-Handling Headquarters

We'll Handle Anything

excepting bulk materials. We hook gravity and power together into complete package conveying systems, linking up all the various departments of a factory to conform to modern progressive assembly practices. Or, we will provide independent conveying units for shipping, packing or any other department.

What is your Conveying Problem?

Is it—

Boxes,
Crates,
Cartons,
Cans,
Trays,
Tote Boxes,
Brick,
Lumber,
Shingles,
Pig Iron,
Castings,
Forgings?

What is your problem?
Let a Mathew's engineer work on it.
No solution, no cost.
No charge for engineering service.
Catalog on Request.

Mathews Gravity Carrier Co.

Branch Factories:

Port Hope, Ont.
London, England

161 Tenth Street,
ELLWOOD CITY, Pa.

Is the Field of the Gasoline Tractor Limited

(*Continued from page 17*)

has a gasoline tractor that can perform in a more limited space than some of the standard electric tractors, and at the same time his machine has a greater towing capacity.

Some of the uses of gasoline tractors are as follows: Merchants or dealers use them for hauling lumber, coal, brick and other materials, both in the yard and in deliveries. Industrial plants and manufacturers use them for transporting loaded trailers about the yard and from process to process in the plant, also for hauling dump wagons and trailers loaded with refuse, to the dumps. Cities, villages and counties use them in building roads, hauling garbage wagons, for cleaning streets and removal of snow. Contractors have found them efficient for excavating, hauling equipment and construction materials, operating stationary machinery and pulling big trucks out of excavations. On the golf course or athletic field, gasoline tractors are used for pulling the lawn mower, roller or other equipment necessary to keep the grounds.

What other class of equipment has such a large range of usefulness and can be operated in such out of the way places as the wilds of South America and Africa, and at the same time be so built that it can operate within the average industrial plant? Flexibility is another point to be considered in favor of this equipment. It operates without tracks or with them, it can be used on one operation today and another tomorrow. Under its own power it can transport itself from one location to another and need not worry about fuel, as gasoline can now be obtained in nearly every locality.

It might safely be said that it is up to the gasoline tractor manufacturers to educate the various industries as to how and where to use this equipment. The average engineer is not familiar with the new developments and consequently he overlooks the opportunities of saving money by installing this type of equipment.

Digitized by Google

THE SEAT OF
Production

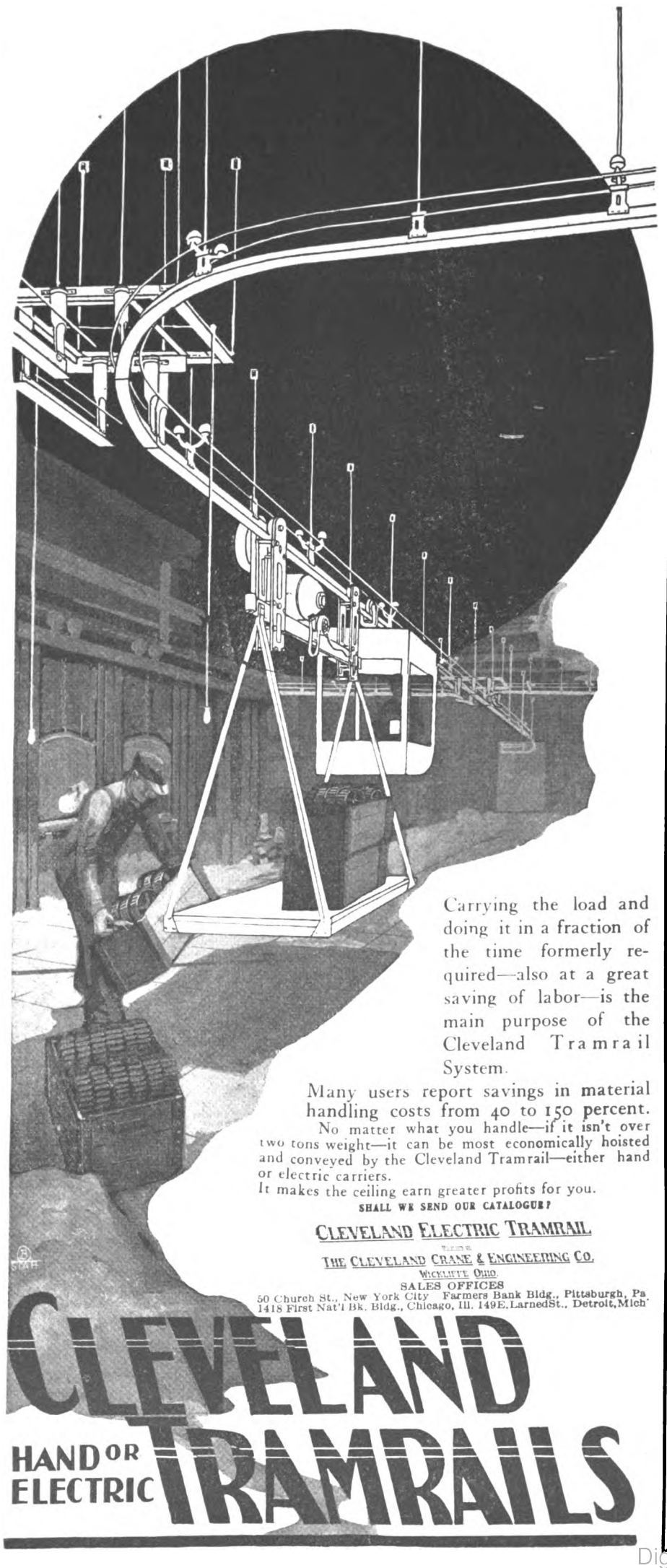


No. FS-22, Patented. Adjustable Legs and Back-Rest

Of course any stool may serve as a seat, but larger institutions prefer to capitalize seating. They buy "Royal-Chicago" Products for the returns in increased efficiency and loyalty.

Royal Metal Mfg. Co.
2312-20 S. Western Ave. Chicago

"Royal-Chicago"
PRODUCTS
THE CORRECT INDUSTRIAL SEATING



Carrying the load and doing it in a fraction of the time formerly required—also at a great saving of labor—is the main purpose of the Cleveland Tramrail System.

Many users report savings in material handling costs from 40 to 150 percent.

No matter what you handle—if it isn't over two tons weight—it can be most economically hoisted and conveyed by the Cleveland Tramrail—either hand or electric carriers.

It makes the ceiling earn greater profits for you.

SHALL WE SEND OUR CATALOGUE?

CLEVELAND ELECTRIC TRAMRAIL

THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE OHIO.

SALES OFFICES
50 Church St., New York City Farmers Bank Bldg., Pittsburgh, Pa.
1418 First Nat'l Bk. Bldg., Chicago, Ill. 149E. LarnedSt., Detroit, Mich.

CLEVELAND
HAND OR ELECTRIC TRAMRAILS

Getting Manpower to Jibe with Horsepower

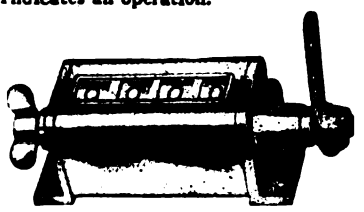
On the *mechanical* end of your machine, a certain amount of horsepower will make things move to your satisfaction.

In the case of the machine *OPERATOR*, it's the power of *interest* and *concentration* that moves to action and gets output.

When the eye of the operator is on his production-record, his *mind* is on running up that record! —with a result that registers most gratifyingly on your

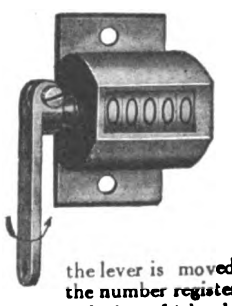
Veeder
COUNTER

The Set-Back Rotary Ratchet Counter below is for machines such as presses and metal-stamping machines, where a *reciprocating* movement indicates an operation.



Registers one for each throw of the lever, and sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figures, as illustrated, $11.50—subject to discount. (*Cut less than ½ size.*) Set-Back *Revolution* Counter of similar model, $10.00 (list).

This small Rotary Ratchet Counter (No. 6) counts reciprocating movements of the lever, as required for recording the output of innumerable small machines. When the lever is moved through an angle of 40 to 60 degrees, the counter registers one. The further the lever is moved, the higher the number registered. A complete revolution of the lever registers ten. This counter can be adapted to no end of counting purposes, by regulating the throw of the lever. Price $2.00. (*Cut nearly full size.*) Small *Revolution* Counter also $2.00.



FREE—This new 80-page booklet shows everything you could ask in a counter Ask for It.



The Veeder Mfg. Co.
63 Sargeant St., Hartford, Conn.

Digitized by Google

HUNT

ELECTRIC MOTOR CARS

Are Cutting Handling Costs in these Fertilizer Plants

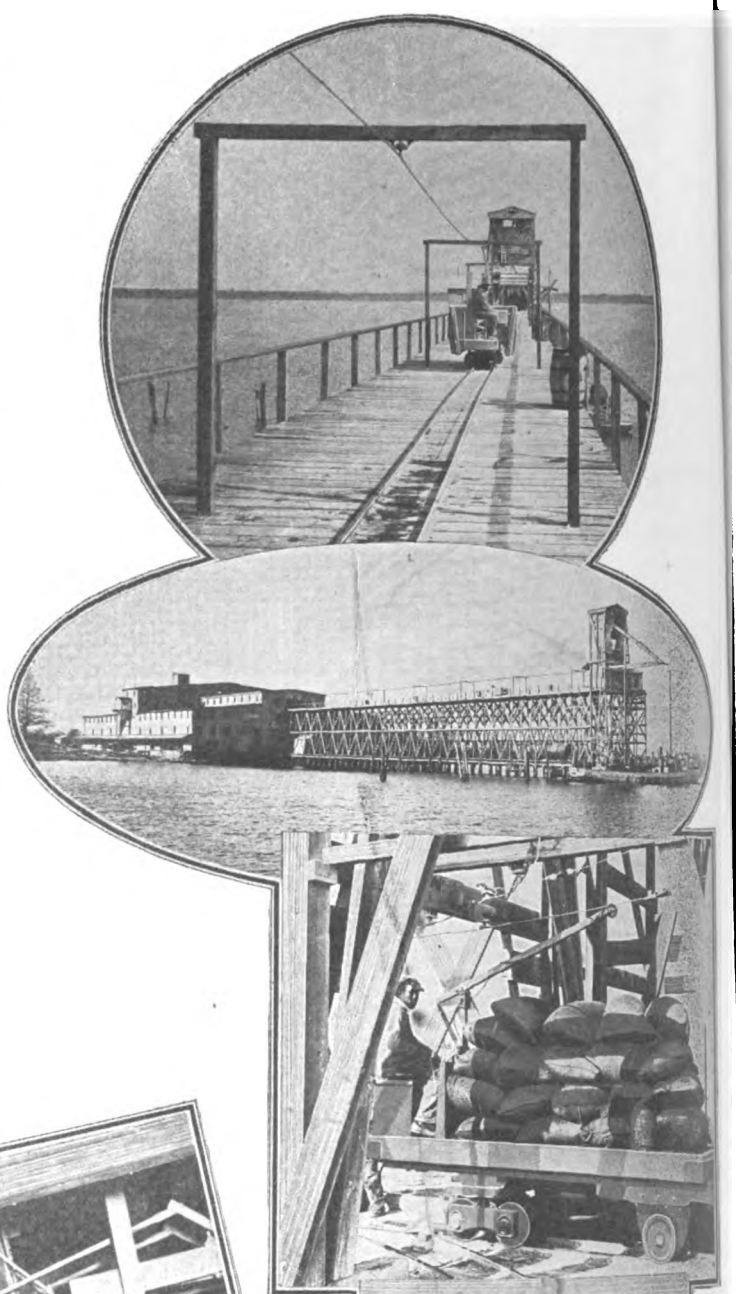
Bulk, bagged and cased material is rapidly transported from pier-head to storage bins, — and can be automatically discharged at any designated point at will,— with the greatest rapidity at a substantial reduction in manual labor and a satisfactory saving in operating and maintenance costs with this —

RAPID-RUGGED-RELIABLE HUNT COST-CUTTING EQUIPMENT

This equipment can also be applied to any industry having similar problems.

Manufactured in single and double Truck drives, for Third rail and single and double overhead Trolley systems. Will operate on 12' 0" radius curves.

Write for literature dealing specifically with this class of equipment.

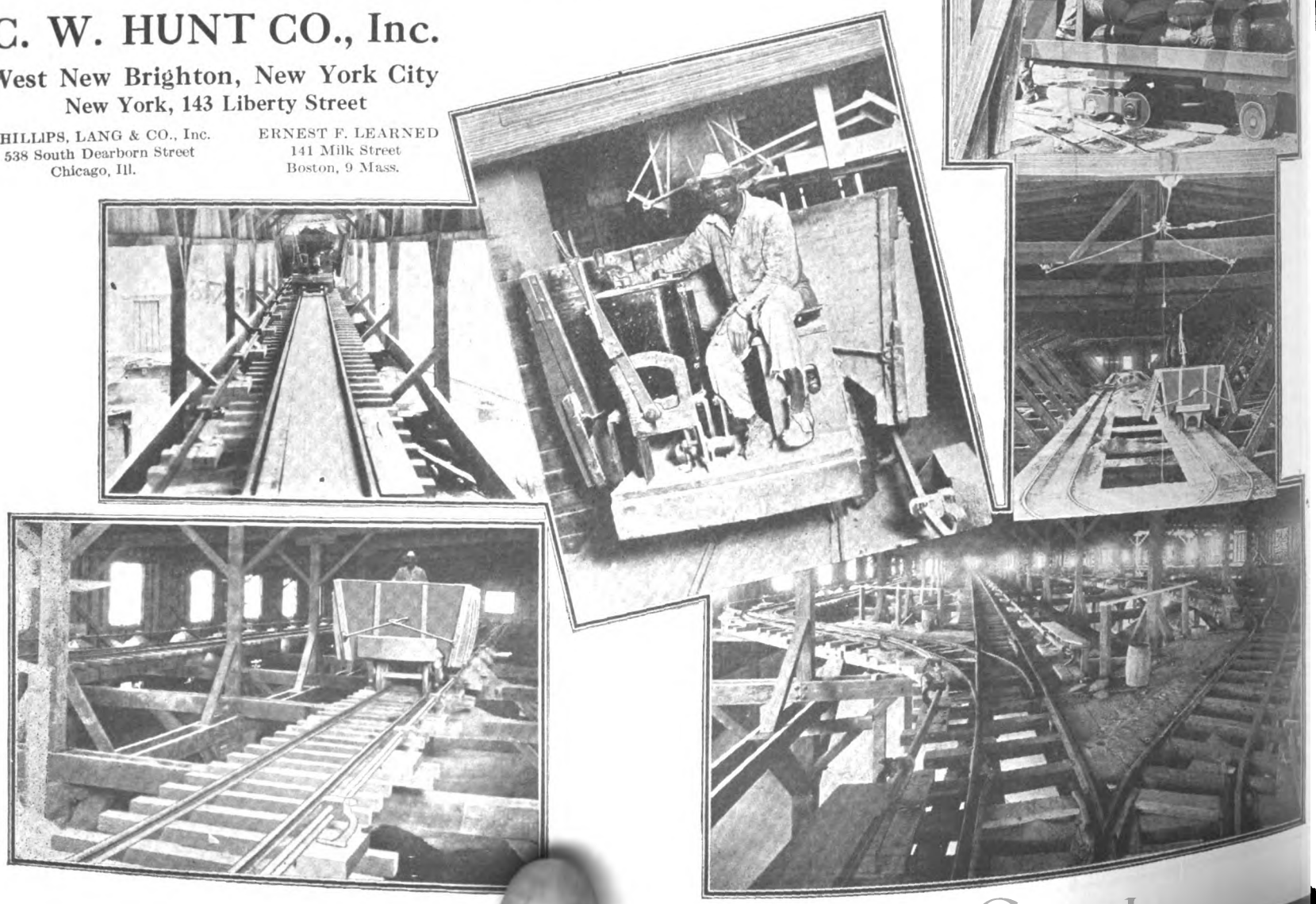


C. W. HUNT CO., Inc.

West New Brighton, New York City
New York, 143 Liberty Street

PHILLIPS, LANG & CO., Inc.
538 South Dearborn Street
Chicago, Ill.

ERNEST F. LEARNED
141 Milk Street
Boston, 9 Mass.



Digitized by Google

What Building Means to Business

(*Continued from page 21*)

functions of production, transportation and distribution. The products which persons and business use may be divided roughly into three classes: first, housing for families, for manufacturing operations, for merchandising, and other purposes; second, the equipment to go into this housing; and third, the supplies required for current use and consumption. Buildings come in the first of these groups, and constitute the more bulky and permanent type of products, the average dwelling, for example, representing a value of from three thousand to four thousand dollars. Machinery, power plant equipment, store fixtures, office furniture, house furnishings, fall in the second class and have a considerable length of life, shorter however, on the whole than that of most buildings; while oil and waste, water, raw materials for factory use, ink and stationery for stores and offices, and food, clothing, coal, gas and other items for family consumption, come in the third class, and are consumed rather rapidly.

Keeping in mind this rough division of the field, let us consider some of the principal facts regarding building as carried on under normal conditions, the volume during the year just past, and the prospects for 1923, together with the relation of this volume of building to manufacture and trade.

The normal volume of building in the United States for nine years prior to the great war, ranged from about two and a half to three and a half billion dollars a year, according to the best figures obtainable. But not all of this was new construction. About one-seventh consisted of additions, alterations and repairs to existing structures; the other six-sevenths were new buildings, as shown by the following chart and table, the latter giving the average percentage over a series of years.

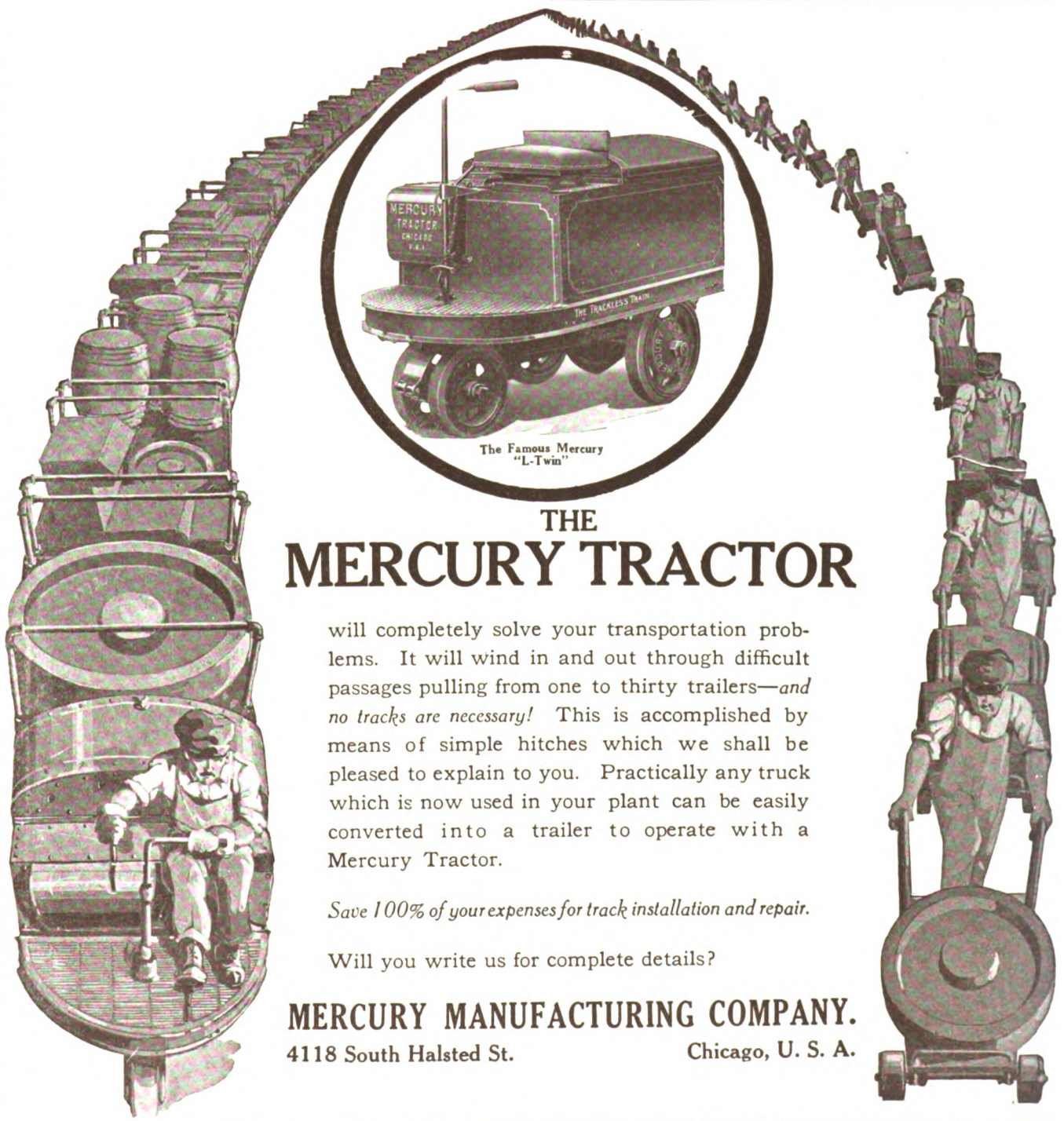
From the table (Table I), it appears that the average percentage of alterations, additions and repairs for the eleven years covered, has been about fourteen percent; which swelled in years such as 1918, during the war, or 1920, the beginning of the depression, to a higher figure, and shrunk to a lower one in 1910, 1911, and 1912. So far as partial figures are available, it appears that in 1922, the proportion of new construction was high, and repairs more nearly normal or below normal.

This volume of building includes several different kinds of buildings, the main purposes for which they are used being for residence purposes (houses, and apartments), manufacturing (mills, factories, repair shops, etc.), merchandising and other business (stores, offices, etc.), and miscellaneous, which includes school buildings and other public structures, churches, theaters, etc.

The diagram (Fig. 2.) and

(*Continued on page 69*)

ONE MAN or FIFTEEN?



The Famous Mercury "L-Twin"

THE MERCURY TRACTOR

will completely solve your transportation problems. It will wind in and out through difficult passages pulling from one to thirty trailers—*and no tracks are necessary!* This is accomplished by means of simple hitches which we shall be pleased to explain to you. Practically any truck which is now used in your plant can be easily converted into a trailer to operate with a Mercury Tractor.

Save 100% of your expenses for track installation and repair.

Will you write us for complete details?

MERCURY MANUFACTURING COMPANY.
4118 South Halsted St. Chicago, U. S. A.

THE TRACKLESS TRAIN

Digitized by Google



P & H Quick Lowering Relay

Increased Profit on Crane Investment

From the first—(nearly 40 years ago)—thorough, careful craftsmanship has been apparent in P & H equipment.

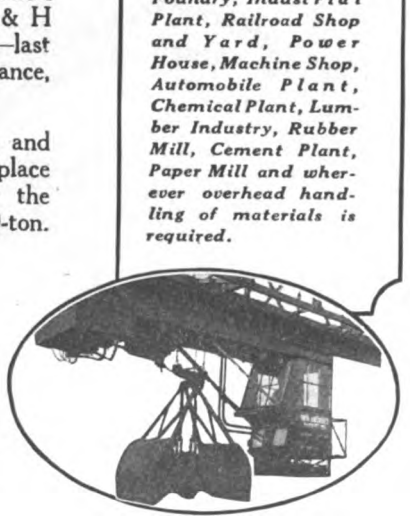
Working for all these years with the one idea of making *good* cranes, hoist and monorails, machine tools, etc., P & H craftsmen have taken advantage of every method and experience to improve the design and manufacture.

The fact that over 7,000 P & H. Traveling Cranes are in use is evidence that industrial men know through experience that P & H Cranes reduce material handling costs—last longer—cost practically nothing in maintenance, —and pay a big return on investment.

There is a precision, an effortless ease and dependability about P & H Cranes that place them quite apart, regardless of whether the unit is of small 3 or 5-ton capacity, or 200-ton.



For the Steel Mill, Foundry, Industrial Plant, Railroad Shop and Yard, Power House, Machine Shop, Automobile Plant, Chemical Plant, Lumber Industry, Rubber Mill, Cement Plant, Paper Mill and wherever overhead handling of materials is required.



P & H Grab Bucket Hoist

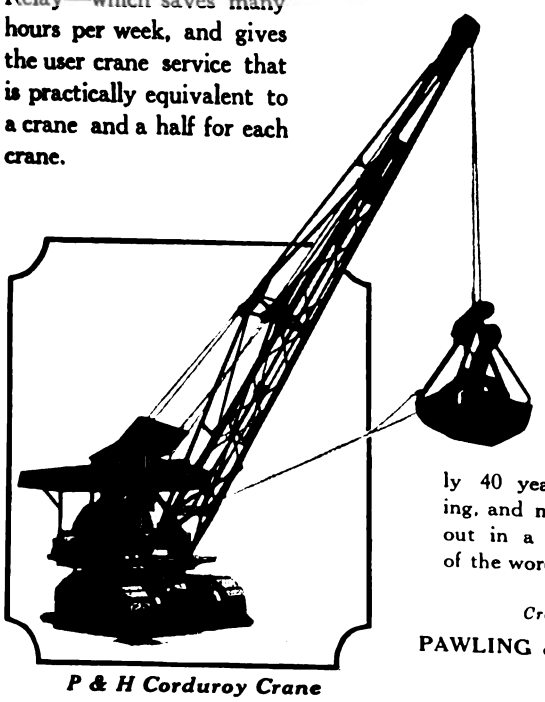
P & H Quick-Lowering Relays Eliminate Wasted Time.

Apart from their inherent qualities, P & H Cranes have the distinctive quick-lowering feature—the result of a patented Relay—which saves many hours per week, and gives the user crane service that is practically equivalent to a crane and a half for each crane.

Front Lever Control

P & H has also developed the safety cage with front lever control giving the operator unobstructed view increasing the speed of handling. And all switch and control parts are entirely enclosed in a cabinet so that there is no chance of coming into contact with live parts.

These P & H features are created and made possible because of the thorough craftsmanship based on nearly 40 years' experience,—sound designing, and manufacturing principles carried out in a plant complete in every sense of the word.



P & H Corduroy Crane

An important labor-saving portable auxiliary for yard work. Travels anywhere on its Corduroy Traction. Operated by ONE man.

Crane and Hoist Division

PAWLING & HARNISCHFEGER CO.

Established in 1884.

3850 NATIONAL AVE., MILWAUKEE, WIS.

New York	*Chicago*	*St. Louis*
Pittsburgh	*Philadelphia*	*Birmingham*
Phoenix	*Denver*	*New Orleans*
Los Angeles	*San Francisco*	*Portland*
Salt Lake City	*Seattle*	*Atlanta*

P&H CRANES and HOISTS

the table below show the proportions of various kinds of buildings erected. These include both new buildings and alterations and the Dodge figures include construction work other than building:

From this table and chart the importance of residential construction is evident. It must be remembered, however, that the large amount of factory building which took place in 1915, 1916 and 1917, to meet war demands, was followed by an unusually small amount of industrial construction, and that the percentage of dwellings during the four years covered may be higher than normal.

An increase in population of fourteen or fifteen million in ten years—to be exact, 13,738,-354 between 1910 and 1920—means, at the rate of five persons to a dwelling (including apartments), some 275,000 to 300,000 new houses or apartments each year. There must be also new stores to serve these new houses, and new factories to make the goods sold in the stores, so that the volume of annual building is roughly in proportion to the increase in population.

The money spent for building is paid out partly for materials, partly for labor and partly for contractor's expenses and profits. The proportion of materials to labor appears to be between three to two, and three to three. According to a study made by the National Federation of Construction Industries in November, 1921, covering the costs of construction of seven different types of buildings, in the Philadelphia district, the proportions are about 44 percent for materials, approximately the same for labor, and about 12 percent for contractor's expenses and profits. For the purposes of this article, these percentages of the costs of construction may be taken as roughly representative of other sections of the country. Assuming that these same ratios held in 1922, the money spent for building, goes mainly to those employed in the building trades, and to manufacturers of construction materials, as indicated on the chart, Fig. 3.

It is obvious that an increase in building of 50 percent over the preceding year, as hap-

Uhl Steel PosturChairs Increased Production 10%

for some workers in a Boston publishing bindery. Fatigue is decreased by the perfect adjustment possible with this chair to the individual seating condition.



There is only one right way to sit. The seated skeleton tells the story.

The PosturChair is designed to fit the seated body. It encourages good posture and makes it the comfortable position. It has been designed by experts in seating. It is approved by a nationally known health organization—the American Posture League, and each chair bears its label.

It is a piece of production machinery and as such is being adopted by large employers of labor everywhere.



This chair supports the body where support is needed and eliminates preventable fatigue.

Special Features: Made of cold rolled steel except seat and back support which are of wood. 10 heights, each with 3" height adjustment. Seat tilts forward or backward. Back support, swivel and adjustable in height. Durably constructed, neatly finished.



There is a style and height to meet any working condition.

TRY ONE AT OUR RISK

If you are seeking more production and greater health protection for your workers, write us for a sample to try under your own conditions. It's free for two weeks use. Mention height needed. Descriptive pamphlets available.

The Toledo Metal Furniture Co.
1604 Hastings St. Toledo, O.

Manufacturers of steel equipment for factories, stores, offices and schools.

Digitized by Google

pened in 1922, means a large increase both in wages and in demand for lumber, cement, brick, structural steel, lime, paint, glass, roofing, and all the other materials required in the erection of structures for business uses, for dwelling, and other purposes.

The first and most immediate effect of this season of active building has been to relieve the worst of the existing shortage of homes and business structures; the second has been to provide steady work for a million and a half or a million and three-quarters wage-earners, whose wages spent in stores and elsewhere. have provided comforts and necessities for their families.

This outlay has made business for the merchant who supplies the goods and for the manufacturer from whom the merchant orders. The effect of the spending of an extra quarter or half billion dollars of wages earned this past year, because carpenters and masons and steel erectors and hod-carriers were in demand, has been to expand the volume of business by that amount and keep money in active circulation.

The indirect effects of active building and the continuous employment resulting are hard to measure. For wages are spent and spendable not only for goods, but for services as well, and the money of the building workers has gone to pay for needed medical care and dental work, for new plumbing, for electrical fixtures, for insurance, for other wants, and this means business for the dentist, the electrician, and professional and service men of all kinds.

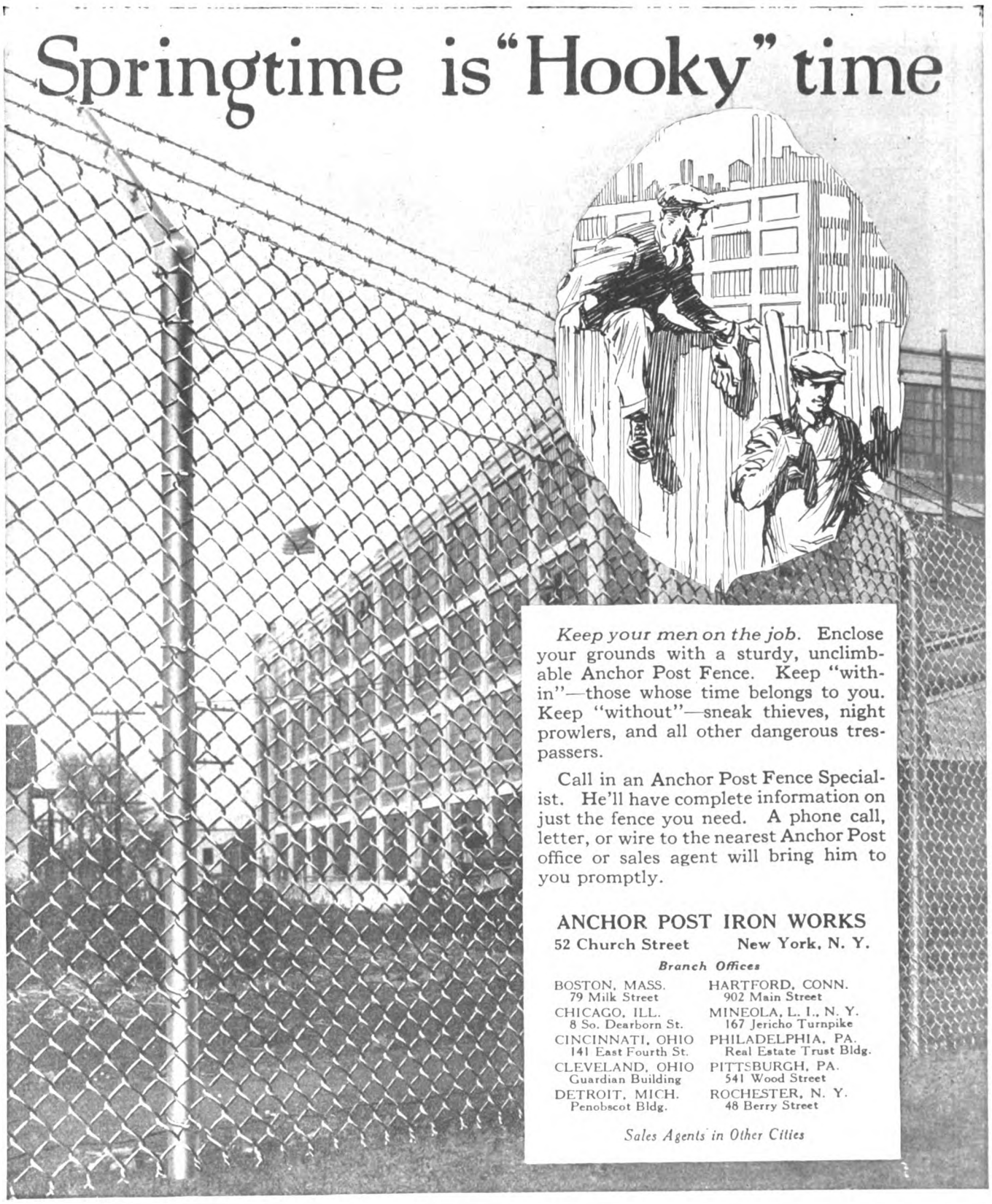
Another direct effect of increased building is the enlarged demand for building materials—l u m b e r, building stone, cement, structural steel, brick, tile, lime, lath, shingles, sash and doors, window glass paint, pipe and sanitary equipment. These basic commodities, which enter so vastly into c o n s t r u c t i o n, represent a volume of production of perhaps three billion dollars and give employment to three-quarters of a million workers. Here again, building means business for manufacturers and busy wage earners.

The workmen employed by sawmills and cement plants, brick yards and glass factories, steel mills, paint works and all the other manufacturers of materials, having more wages to spend, spend more, in stores and retail shops, for personal and home betterments; and the money circulates actively throughout the community. It is clear that there is a close connection between brisk building, and good business for retail merchants and for the manufacturers from whom they buy their goods.

The third direct effect of increased building is in the field of the equipment of buildings. At this point the figures begin to have significance for another group of manufacturers —those who supply fittings and furnishings for all the various kinds of buildings, which cover a wide range.

In general, these products fall into two classes, and constitute two fairly distinct markets—one, the equipment required for business and miscel-

Springtime is "Hooky" time



Keep your men on the job. Enclose your grounds with a sturdy, unclimbable Anchor Post Fence. Keep "within"—those whose time belongs to you. Keep "without"—sneak thieves, night prowlers, and all other dangerous trespassers.

Call in an Anchor Post Fence Specialist. He'll have complete information on just the fence you need. A phone call, letter, or wire to the nearest Anchor Post office or sales agent will bring him to you promptly.

ANCHOR POST IRON WORKS
52 Church Street New York, N. Y.

Branch Offices

BOSTON, MASS. 79 Milk Street
HARTFORD, CONN. 902 Main Street
CHICAGO, ILL. 8 So. Dearborn St.
MINEOLA, L. I., N. Y. 167 Jericho Turnpike
CINCINNATI, OHIO 141 East Fourth St.
PHILADELPHIA, PA. Real Estate Trust Bldg.
CLEVELAND, OHIO Guardian Building
PITTSBURGH, PA. 541 Wood Street
DETROIT, MICH. Penobscot Bldg.
ROCHESTER, N. Y. 48 Berry Street

Sales Agents in Other Cities

FIRM—BECAUSE THEY ARE ANCHORED

Anchor Post Fences

PERMANENT—BECAUSE THEY ARE GALVANIZED

Digitized by Google

MATERIAL



ELECTRIC TRACTORS

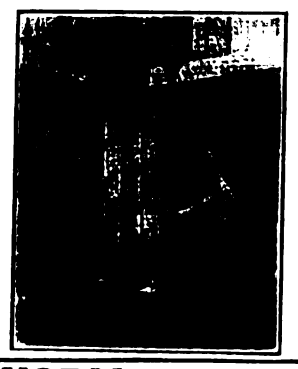
Transport Tons

where hand trucks move pounds. They reduce expense in all your departments.

Request Catalog 1208.

The Elwell-Parker Electric Company

Cleveland, Ohio



MOTORBLOC

The Motor Driven Chain Hoist

The MOTORBLOC is hung up like any chain hoist.

He is pulling 1 Pound to Lift 2200 Pounds.

Light—Portable—Steel-Strong

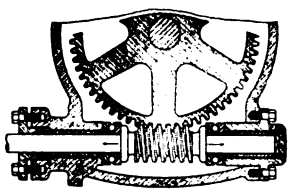
"Hook Up, Plug In, Let's Go." Write for full details



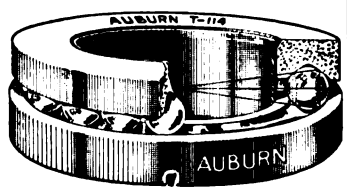
MOTORBLOC CORPORATION

Summerdale PHILADELPHIA

WORM DRIVES OPERATE MORE SMOOTHLY WITH **AUBURN THRUSTS**







Reduce back lash, increase the life of both Worm and Gear, and get smoother operation by using AUBURN BALL THRUST BEARINGS. Tell us your problem and get the Auburn Answer. Ask for Catalogue.

STEEL BRASS AND BRONZE BALLS

AUBURN BALL BEARING COMPANY

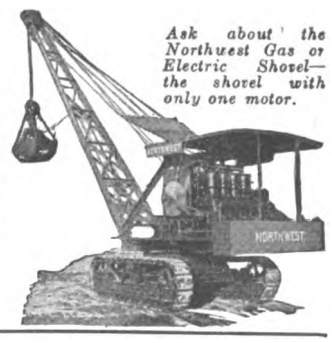
20 INDUSTRIAL STREET ROCHESTER, N. Y., U. S. A.

Unrivalled Utility a Result of Unmatched Mobility—

You may buy the Northwest with the idea of using it for routine handling work—but you'll be surprised at the number of odd jobs it will do in spare time. Handles coal, ash, stone, sand, gravel with 1 yd. clamshell bucket on 40 foot boom; timbers, logs, stone slabs, pipe, building forms with grappling hooks; steel and iron scrap with powerful electric magnet; acts as dragline or as pile driver.

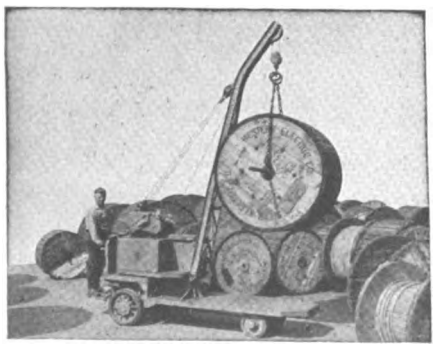
Northwest crawler base with truck-like steering device is controlled by one man; unequalled mobility; will mount pile and double-deck. Ask for specifications.

Northwest Engineering Co., 1231 Steger Bldg., Chicago, Ill.



Ask about the Northwest Gas or Electric Shovel—the shovel with only one motor.

NORTHWEST CRAWLER CRANE



Easiest Way to Handle 3,000 Pound Pieces

is on Electric Industrial Trucks equipped with REVOLVING CRANES.

Bulletin 51 tells how.

The Elwell-Parker Electric Company

Cleveland Ohio

HANDLING

laneous uses, the other, for dwellings. For new factories and additions to existing factories there must be provided a long list of items ranging all the way from ventilating systems or special flooring to simple objects such as time slips or lead pencils. In the list there are electric cranes and hoists, steam power installations, pumps of various kinds, motors, pulleys, industrial trucks, tanks, valves, fans and blowers, fencing, gauges and other instruments, time clocks, carriers and conveyors, scales, stencils, steel lockers, control boards. In office buildings there must be elevators, revolving doors, heating apparatus, electric lighting, rubber mats. For stores must be provided shelving, counters, lighting fixtures, special display racks, scales or measuring devices, cash registers, cash carriers, and other items. For schools and churches, theaters and public buildings must be made special furniture, lighting fixtures, and products harder to classify under the common heads. Dwellings require electric wiring and fixtures, furnaces, stoves, kitchen utensils, dishes and glassware, dining tables, lamps, easy chairs, mirrors, beds, bureaus, and the thousand and one things with which the new house must be supplied. The makers of furniture and chairs and cutlery, of kitchen ranges and coal stoves and wood heaters, of boilers and stovepipe, of wall paper and shades and curtains and carpets and rugs, —all these have to supply needs created by new homes. And a considerable part of the present unusual demand comes from those who, having sold their former homes, have been living for months in cramped and narrow quarters, and are just now getting back to the size and kind of home that they had before the war.

Closely connected with equipment items and sometimes difficult to separate sharply from them is the long list of supplies required not only for personal consumption in homes but also for everyday use in business. Offices require filing cabinets, typewriters, adding and calculating machines, paste, paper, ink, clips, pins, blotters, pens, carbon paper. Stores use brooms, window cleaning supplies, light



No. 644 Gauntlet Glove, reinforced with flexible steel ribbons clinched over strips of tough leather. Extra leather patch on the thumb.
$16.00 per dozen pairs.

A Better Day's Work with

STEEL-GRIP GLOVES

The Added protection of STEEL-GRIPS aid the men in giving a better day's work.

Three thicknesses of wearing surfaces and a comfortable lining—steel ribbon re-inforcement clinched over tough strips of leather—strong steel thread stitching—all tend to give the workers confidence that their hands will be safe from bruises and cuts. And there's no danger of seams ripping, burning or tearing out.

STEEL-GRIPS save time by eliminating frequent trips to the store-room, because they are built stronger and wear longer.

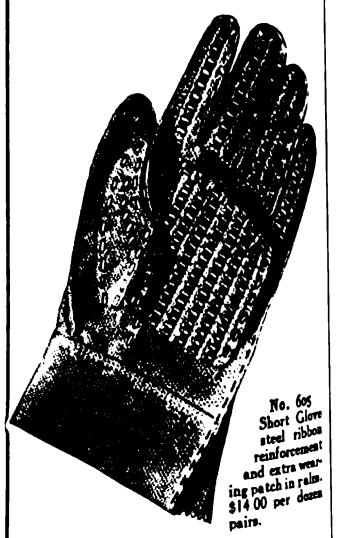
There's a style for every condition. Try a dozen pairs—you'll see the difference.

Send in your order to-day.

Catalog sent on request

INDUSTRIAL GLOVES CORP.

2647 Maplewood Ave., Chicago.



No. 605 Short Glove steel ribbon reinforcement and extra wearing patch in palm. $14.00 per dozen pairs.

STEEL GRIP

Digitized by Google



When the Leviathan Goes to Sea

the pride of the U. S. Merchant Marine will represent the best efforts of American science and engineering. Deep within the heart of this magnificent liner, the steady pulse and throb of motive equipment denotes power,—power generated without loss or waste,—power conserved and utilized to the utmost.

SIL-O-CEL

A CELITE PRODUCT

guards the Leviathan boilers from heat and power waste. This high temperature insulation was selected for such exacting service because it possesses the lowest heat conductivity of any known material. Placed between firebrick and outer shell, it saves fuel, increases capacity, maintains uniform temperature and protects the outer shell. Firebrick is laid up with Fraxite (High Temperature Cement), another Celite Product.

Sil-O-Cel Insulation is furnished in four convenient forms,—brick, block, powder and cement. It is low in cost, easily applied,—a permanent insulation.

Write for details on insulating your equipment. Specific data given in Bulletin W-6C, or use the coupon.

Celite Products Company

New York 11 Broadway-Chicago 53 W. Jackson Blvd.
San Francisco Monadnock Bldg.
Offices and Warehouses in Principal Cities
CELITE PRODUCTS LIMITED
New Birks Bldg., Montreal, Canada

CELITE PRODUCTS COMPANY

Gentlemen: Send Bulletin W-6C and explain in detail the advantages of SIL-O-CEL Insulation, how it saves fuel, increases capacity and maintains even temperatures. I am particularly interested in the insulation of

.....

Name Type of Equipment

Name.....

Firm Name.....

Address.....

bulbs, wrapping paper, twine, circulars and bill-heads. Factories must have an even longer list of supplies. Dwellings require foodstuffs of a wide variety, clothing, coal, fuel, books, and other items of daily consumption.

Figure 4 shows some of the more important products used as equipment or supplies mainly in business or industrial buildings of one kind or another. Some of these products and others not shown for lack of space are used also in connection with dwellings and miscellaneous structures.

Many of the products listed on this chart are supplies for use in connection with existing structures. Others constitute the initial furnishings for new buildings or additions to old. It is not feasible to separate equipment sharply in all cases from supplies; in general, however, the market for the more permanent and durable products lies in connection with the newer buildings, the first equipment of which is likely to suffice for some time. Even in the field of current consumption items, new buildings mean added business.

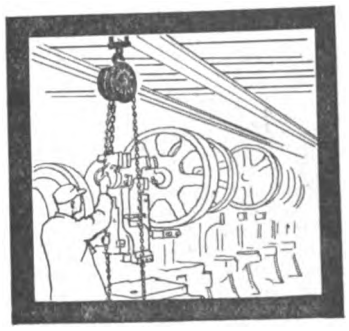
Building, therefore, is the first step in the process of making and distributing a great variety of goods. It supplies a definite location and shelter for the many activities which men carry on. Construction is necessarily followed by equipment and equipment once installed requires maintenance, and with it the whole long list of commodities currently consumed. Active building such as that of 1922, means not only additional wages for workmen, and increased demand for building materials, but also more business for manufacturers of equipment and supplies of nearly every kind.

For these reasons the prospect for 1923 is of particular interest. Will building continue to be as active during this coming year as it was during 1922?

To answer this question, it is necessary to go back to the period of the war and see just how far behind the country got in building, and to what extent the shortage has been made up already.

As previously shown, the average volume of building in the entire country annually, prior to the war (which cre-

MATERIAL



Chain Hoists for All Purposes



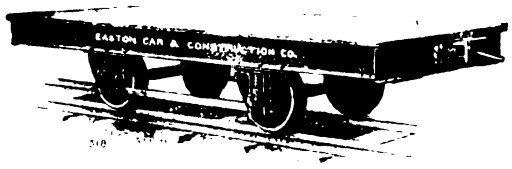
¼ to 30 Tons Capacity

Safe Dependable Economical

WRIGHT *Our catalog will interest you*

Lisbon, Ohio

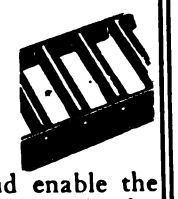
EASTON CARS



COMPLETE INDUSTRIAL RAILWAY EQUIPMENT

178-E
EASTON CAR AND CONSTRUCTION CO.
Main Office & Works: 45 Holley St., Easton, Pa.

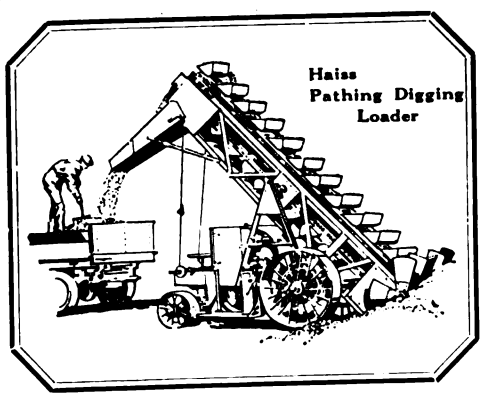
***"Handling"* is the wrong word**



when applied to Dow Conveyors. *Handling* suggests *carrying by hand* whereas the very purpose of Dow Conveyors is to dispense with costly human effort in moving parts and finished products from one place to another. Dow Conveyors (Gravity and Power) do away with porters and enable the skilled mechanic to devote *all* of his time to production instead of intermittently walking the floor. Many manufacturers are not aware of the time-labor-and money-saving ability of Dow Conveyors. The facts are yours for the asking. The Dow Co., Incorporated, Louisville, Ky.



DOW CONVEYORS



Stop Shoveling!

HAISS

Truck Loaders

do the same work—dig as well as load—ten times as fast at fractional cost.

See data in Bulletin 621

The Geo. Haiss Manufacturing Co., Inc.
146th St. & Canal Place, New York
Established 1892
Representatives throughout the world

YOUR ADVERTISEMENT

for the next issue of INDUSTRY ILLUSTRATED is now due.

The first closing date is the 10th of the month preceding the issue. In order to get good service cuts and copy should be in as soon after the 1st of the month as possible. Send all advertisements to

Advertising Department
120 West 32nd St. New York

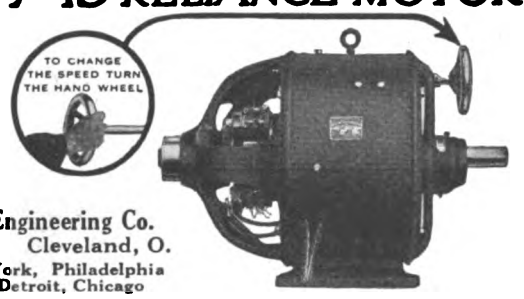
HANDLING

Digitized by Google

POWER

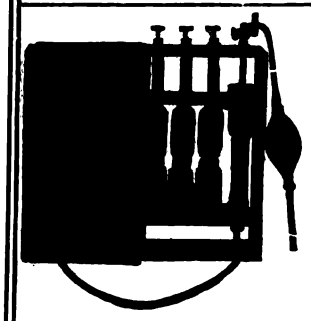
THESE motors will provide your machines with operating speeds to suit all kinds of jobs. They run at any speed over ranges up to 1 to 10. There is no power lost as speed is varied.

Type A.S. Adjustable Speed RELIANCE MOTORS



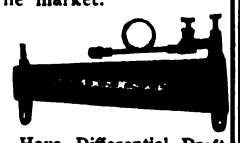
Get bulletin 1014 for details

Reliance Electric & Engineering Co.
1045 Ivanhoe Road Cleveland, O.
Branches: Boston, New York, Philadelphia
Pittsburgh, Cincinnati Detroit, Chicago



TWO INSTRUMENTS WITHOUT EQUAL as aids in cutting fuel costs are pictured here. Each is the very best of its kind on the market.

We have for free distribution to power plant men some intensely interesting and instructive pamphlets about flue gas analysis and draft regulation. It will pay you to write for them.



Hays Differential Draft Gage. Baked black enamel finish, steel case Rugged, accurate.

Hays Improved Gas Analyzer. Note absence of pinch clamps, rubber connections and glass cocks.

The Jos. W. Hays Corporation
Combustion Efficiency Appliances
Michigan City, Indiana

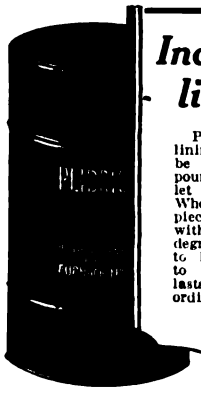


"CALOREX" Burners
Using STEAM or AIR for Atomizing

MOUNTED FOR BOILER

33 years experience manufacturing liquid fuel equipment. Cheapest to operate—Simple in construction. *No parts to wear out*—Will last a life time. Burns FUEL OIL, CRUDE OIL or TAR. Write for catalog

W. N. BEST FURNACE & BURNER COMPANY
11 Broadway ENGINEERS IN CALORIC NEW YORK



Increase furnace life with—

PLIBRICO
FURNACE LINING

Plibrico is a plastic furnace lining in unbaked form. It can be applied by anyone who can pound it into place with a mallet and trowel it smooth. When baked, it forms a one-piece, jointless furnace lining that withstands temperatures to 3100 degrees F. There are no bricks to loosen and fall out—no joints to crack. Consequently, Plibrico lasts two to four times as long as ordinary furnace linings.

Put an end to furnace troubles—do it the modern way—the economical way. Next time, reline with Plibrico—or old, broken fire brick linings, when patched with Plibrico, often give months more service.
Plibrico is sold only in steel containers of distinctive appearance as shown opposite.
Write for new fifty-page booklet, just off the press— "Modern Furnace Building."

Jointless Fire Brick Company
1154 Clay St. Chicago

CLOSING DATES FOR ADVERTISEMENTS

Cover and Special Positions, 5th of month preceding issue.
R. O. P. Ads to be set . 10th " " " "
R. O. P. Ads Plated . . 15th " " " "
It is to your advantage to send copy and cuts as soon as possible.

Advertising Department
INDUSTRY ILLUSTRATED
120 W. 32nd St., New York

EQUIPMENT

ated the present shortage) was between two and a half and three billion dollars a year. In forty cities for which we have continuous figures since 1900, the average aggregate value of the buildings for which permits were granted annually was about $600,000,000. The war however, took the men engaged in the building trades away to work in constructing training camps, building ships, and to service overseas. Also, materials, for peace time structures were hard to get. The construction that took place during 1917 and 1918 was of government cantonments, munition works, piers and ships, and war-time factories which had not previously expanded. The building of dwellings, stores, schools, and office buildings was postponed. This meant that people were crowded into narrower quarters; merchandising had to be done with existing facilities and existing offices had to handle increased business. The steadily expanding number of school children had to study and recite in existing class rooms, halls and laboratories. When the war was definitely over, therefore, people set about remedying the situation of cramped conditions, and the active building of 1922, and what is to come in 1923, are an effort to provide the needed housing, stores, schools and office structures.

The effect of the war was not only to greatly reduce building, but also to increase the costs of building, so that

TABLE 1.

Proportion which additions, alterations and repairs constitute of total building operations in over 100 leading cities of the United States, 1910-1921.[a]

Year	No. of cities reporting	No. of building permits	Value of permits (millions of dollars	Percent. which new construction is of total	Percent. alterations and repairs are of total
1910	127	282,661	$ 854	90	10
1911	108	215,248	731	88	12
1912	105	198,272	660	88.4	11.6
1913	108	203,746	608	85	15
1914	113	205,728	545	84.6	12.4
1915	123	251,765	655	85.8	11.2
1916	129	308,498	853	83	17
1917	129	240,936	633	82	18
1918	132	200,786	373	72	28
1919	141	365,972	1,303	85	15
1920	131	405,941	1,343	80	20
Average			1600	85.9	14

[a] U. S. Geol. Survey, 1910-1919: U. S. Bureau of Labor Statistics, 1920.
[1] 9.81 plus part of undistributed 0.41 per cent.
[2] Approximate.
[3] Undistributed, about 2 per cent.
[4] Undistributed, about 4 per cent.
[5] Undistributed, about 5 per cent.
[6] Undistributed, about 3 per cent.

Table 2, Percent. of Value of Total—Represented by Different Classes of Buildings

	(per cent) Building permits U. S. Bureau of Laor Statistics.	Contracts awarded (F. W. Dodge Co.)			
	1920	*1919*	*1920*	*1921*	*5*
Residential	40	33	22.3	37.2	
Industrial	16	19.9	23.0	7.3	
Stores, Offices and other commercial	24	15.7	17.3	14.3	
Other buildings	20	31.4	37.4	41.2	

Table 3. Volume of Building in Forty Cities, in true Prices.

Year	*Volume of Building in 40 cities (Millions of Dollars)*	*Index number of Building costs (1913=100%)*	*Volume of Building in 40 cities in prices of 1913 (Millions of Dollars)*
1912	680		
1913	606	100	606
1914	553	96	576
1915	601	98	613
1916	734	114	644
1917	461	139	331
1918	272	153	177
1919	846	167	506
1920	914	224	408
1921	1143	179	638
1922	1715	177	970

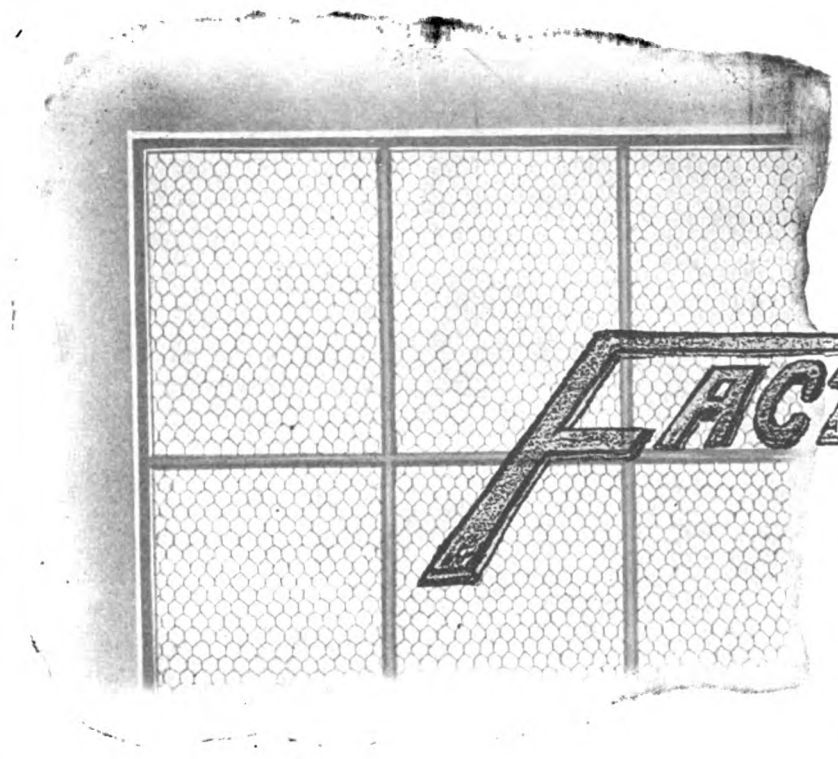
Digitized by Google

: the peak of prices in 1920, ıe prices of building mater-.ls as a whole were three mes what they were in 1913, hile building wages rose to vice their former level. By 922, building costs, made up f material prices and wages, ad fallen to about one hun-red and seventy-five, or one nd three-fourths times those f 1913. To compare the real olume of building—as meas-red by floor space in 1922, or example—with that in 1913 r 1914, it is necessary not ıerely to look at the total ıoney cost, but to reduce this ıoney cost to terms of physi-al volume of building by di-'iding the money cost by one ınd three-fourths, the number)f dollars which in 1922 were 'qual in purchasing power to)ne dollar in 1913. When this s done the 1922 volume of)uilding which at first sight ıppears as of unheard of pro-)ortions, proves to be a much nore moderate figure than was supposed. A glance at the fig-ures of building in forty cities for each year since 1912, with the corresponding value in 1913 prices since that date, shows at once what the 1922 figures really mean in terms of actual physical building, the index number of costs being merely a means of showing that it takes one and seventy-seven one-hundredths dollars now to buy what one dollar bought in 1913.

From this table it is clear that the normal building in these forty cities from 1913 to 1916 in terms of 1913 prices was about 600 million dollars a year, and that the building during the four years 1917, 1918, 1919 and 1920 amounted altogether to about 1,400 million dollars (in 1913 prices) in place of a normal 2400 million dollars (4 years at 600 million a year) or a shortage of about a billion dollars in these forty cities. This is equivalent to one and two-thirds years shortage—that is, it is the same as if we had done no building at all for one and two-thirds years, but were now starting to catch up. The year 1921 appears to have had about a normal amount of building, but in 1922 the building amounted to one and a half times that of 1921. We have made up during 1922, in other words, a half year of the shortage, but there remains yet something over a solid year of building before we shall have made it up completely. This is a remarkable achievement, when it is remembered that this is in addition to the normal volume of building which is required every year.

That is why it is certain that 1923 will be another year of exceptional building, unless prevented by unduly high costs of materials and labor, both of which are at present trending upward. The chart (Fig. 5) shows the upward movement of prices and wages since the low points of 1921 and early 1922.

With the cost of living at 166 and building at 180 with a tendency to go higher, the question is how far building can progress on the strength of the present shortage before it encounters something like another buyer's strike. As long as building proceeds, however, it will increase the demand for other goods, as shown, and will help to stimulate the business of the entire community.



A New Advance in Daylighting Industrial Plants

Knowing the importance of greater conservation of daylight, research work of this company has for many years been directed toward the production of a glass with high diffusing power.

Great areas of the sidewalls and roofs of modern factories are built with steel sash and glass. It has been our aim to make this expenditure for daylighting give greatest RESULTS.

In FACTROLITE there is offered to the engineering public a glass of **greatest daylighting** power.

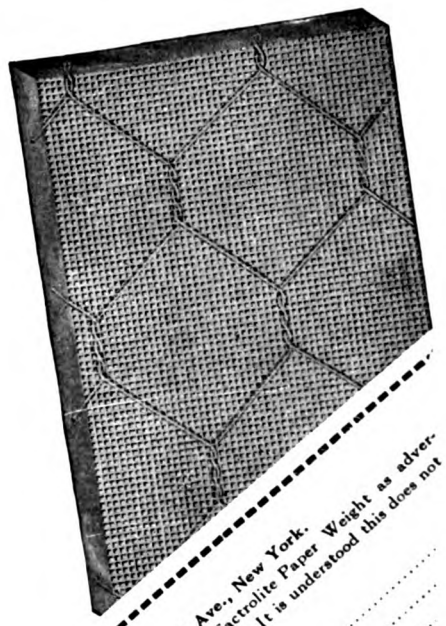
Every square inch of its surface has 900 prisms that appear like tiny corrugations. Their shape and size have been scientifically determined to promote DIFFUSION.

The United States Government used over 100,000 sq.ft. of FACTROLITE for a single great building.

We have had tests made by the Electrical Testing Laboratories which will interest every engineer.

FACTROLITE gathers daylight on dark days. It diffuses the glare of direct sunlight on bright days.

Send the coupon for full data—and a free sample of FACTROLITE.



Mississippi Wire Glass Company
219 Fifth Avenue, New York
CHICAGO **ST. LOUIS**

Mississippi Wire Glass Co., 219 Fifth Ave., New York.
Gentlemen: Send me a Catalog and Factrolite Paper Weight as advertised in Industrial Management. It is understood this does not obligate me in any way.

Name .....

Address .....

Digitized by Google

RICHARDS-WILCOX R-W AURORA TRADE MARK

Richards-Wilcox

Quality leaves its imprint

RICHARDS-WILCOX R-W AURORA TRADE MARK



Starting a One-Ton Weight With the Little Finger

Do you know how many men are required to move a heavy load with your present overhead conveying equipment? If more than one is necessary you are encouraging a needless waste of time and money. For it is now recognized that, with the proper type of trolley, the work can actually be done better by one man working alone. This was proved conclusively by a recent competitive test of the—

R 925 W Ball-Bearing I-Beam Trolley

The test was made not only for weight carrying capacity, but for the easy starting and conveying of heavy loads. A one-ton weight was used. One widely-known competitive trolley required a pull of 200 pounds to start the load. *The R-W 925 Trolley* was started with its one-ton load by the pull exerted by a man's little finger—approximately a 30-pound pull.

Free Engineering Advice

All problems pertaining to the adoption of overhead conveying methods in your plant can easily be solved for you by our Engineering Department. Their experience covers installations for practically every line of business. Their advice and the preparation of plans will not place you under any expense or obligation.

The *R-W 925 Trolley* is made in seven capacities, ranging from 1/4-ton to 4-tons. All are described in Catalog DD-23, a copy of which will be sent to any manufacturer on request.

Test At Our Expense

Our faith in the ability of the *R-W 925 Trolley* to meet *your* most exacting requirements leads us to make this offer. Tell us your requirements and we'll send a Trolley of suitable capacity. Put it to the test of actual working conditions. If this free trial fails to come up to your expectations, send the Trolley back at our expense. That will end the matter.

New York
Boston
Philadelphia
Cleveland
Indianapolis
St. Louis

Richards-Wilcox Mfg. Co.

A Hanger for any Door that Slides

AURORA, ILLINOIS, U.S.A.

RICHARDS-WILCOX CANADIAN CO., Ltd.

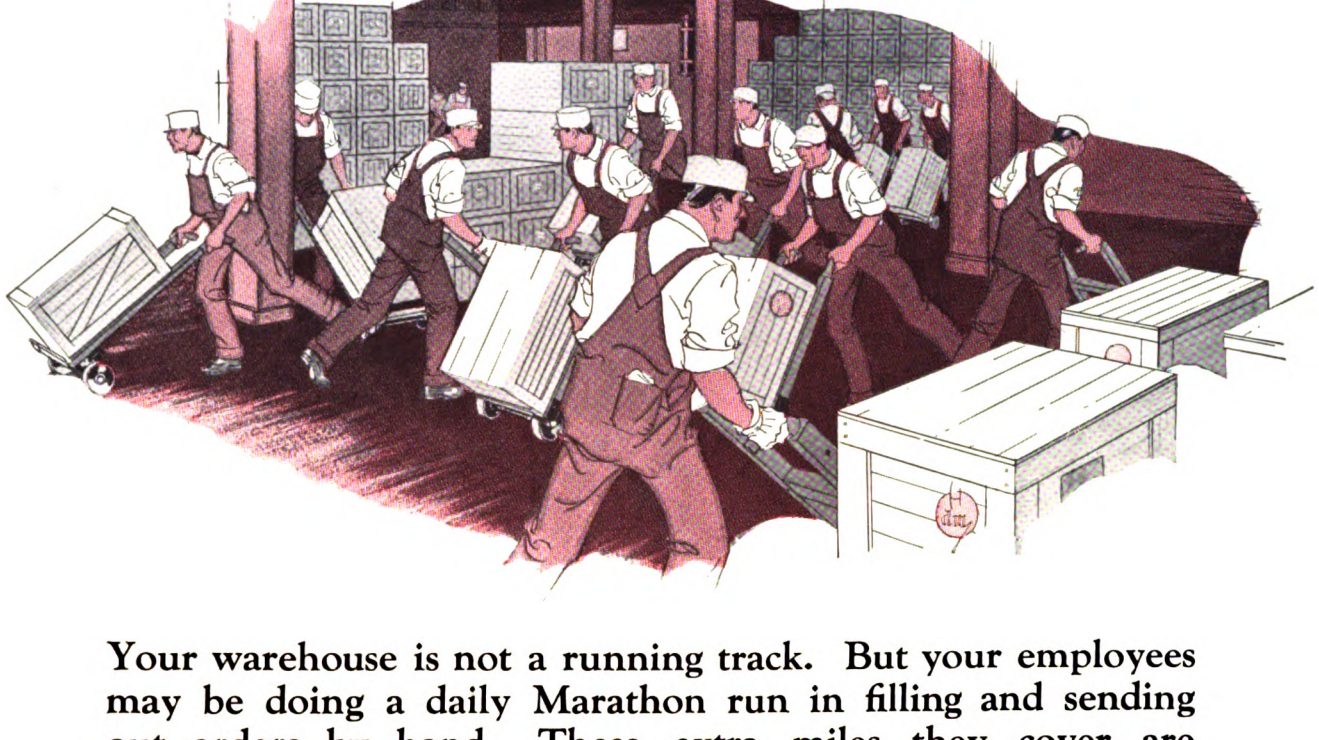
Winnipeg LONDON, ONT. Montreal

Chicago
Minneapolis
Omaha
Kansas City
Los Angeles
San Francisco

1401

Digitized by Google

Are you running an industrial Marathon?



Your warehouse is not a running track. But your employees may be doing a daily Marathon run in filling and sending out orders by hand. These extra miles they cover are expensive miles to you, who pay for every foot they walk.

THERE is one way for you to stop this industrial Marathon. With a mechanical conveying system an orderly procession of goods moves in a steady, continuous stream through your warehouse. Such a system handles incoming and outgoing merchandise quickly and cheaply. It does away with rehandling, with the confusion, delay and breakage of hand-trucking and gives more space for storage.

Lamsonize your warehouse

The Lamson system makes use of pneumatic tubes to send copies of orders to the clerks who must see them. Then they go to the stock department.

Merchandise is picked up from different bins, placed in baskets, and dropped on conveyors to the shipping room. There orders can be assembled, packed, and taken to trucks and cars on conveyors.

Inclined or vertical elevator conveyors raise incoming packages to storage points on floors above. Portable conveyors can then carry them to special bins or stock piles. Empty baskets go back to departments the same way.

Lamson Conveying Systems are putting many warehouses on an automatic basis. They speed up shipments and save rehandling costs. They release hand-trucking and carrying labor for productive work.

How about a system for you?

If your employees are now doing an industrial Marathon, perhaps Lamson Conveyors can stop it. At your request, a Lamson engineer will visit your warehouse. After studying your handling methods, he will be able to tell whether conveyors will make it more efficient and profitable.

Should Lamson Conveyors be indicated, they can be built unit by unit, each unit beginning to pay for itself at once. And after installation we will gladly show you how to get the greatest efficiency from them.

THE LAMSON COMPANY
SYRACUSE, N. Y.
Branches in Principal Cities

LAMSON SERVICE

Lamson Conveying Systems

Digitized by Google



There IS a way out

TWO, three, four, maybe a dozen men released for other work.

—greater speed, efficiency and remarkably low cost in the movement of material—the picking up, carrying, and putting down of loads—which is usually the most costly item in either manufacturing or distribution.

—freedom from subserviency to the "supply and demand" of labor.

—permanent help instead of fluctuation and uncertainty.

—a remedy for labor shortage, not found in "help wanted" columns.

—the *LiftAbout* has done all this for hundreds of business executives. It has provided "plenty of help," and has been a way out of many perplexing labor problems.

Every one of these powerful little electric hoists in service, and it is used in practically every line of business, is making an actual dollars and cents saving for its owner.

This fact, together with the *LiftAbout*'s wide application and its low price, really make it a hoist for everybody who has loads to move and lift.

Permit us to show you the way to adequate, permanent help. **MAIL THE COUPON.**

SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities Member Electric Hoist Mfrs. Assn.

SHEPARD
ELECTRIC CRANES & HOISTS



THE SHEPARD ELECTRIC LIFT ABOUT

HEPARD ELECTRIC CRANE & HOIST CO.,
o Schuyler Ave., Montour Falls, N. Y.

nd us descriptive folder of the *LiftAbout* shown in many plications.

rm: .....

ttention of: .....

ddress: .....

.....

Digitized by Google

MAY 1923

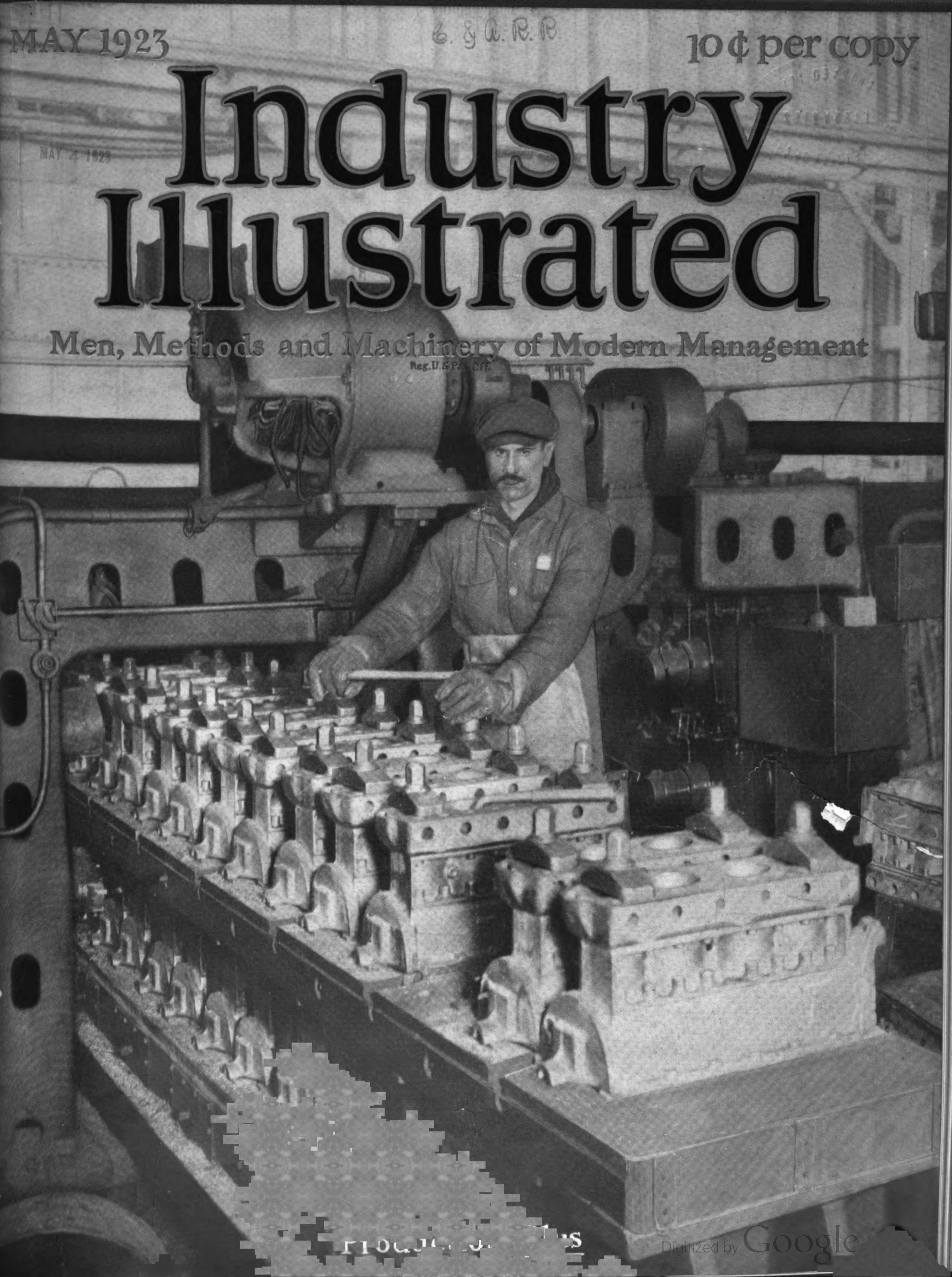
C. & A. R. R.

10¢ per copy

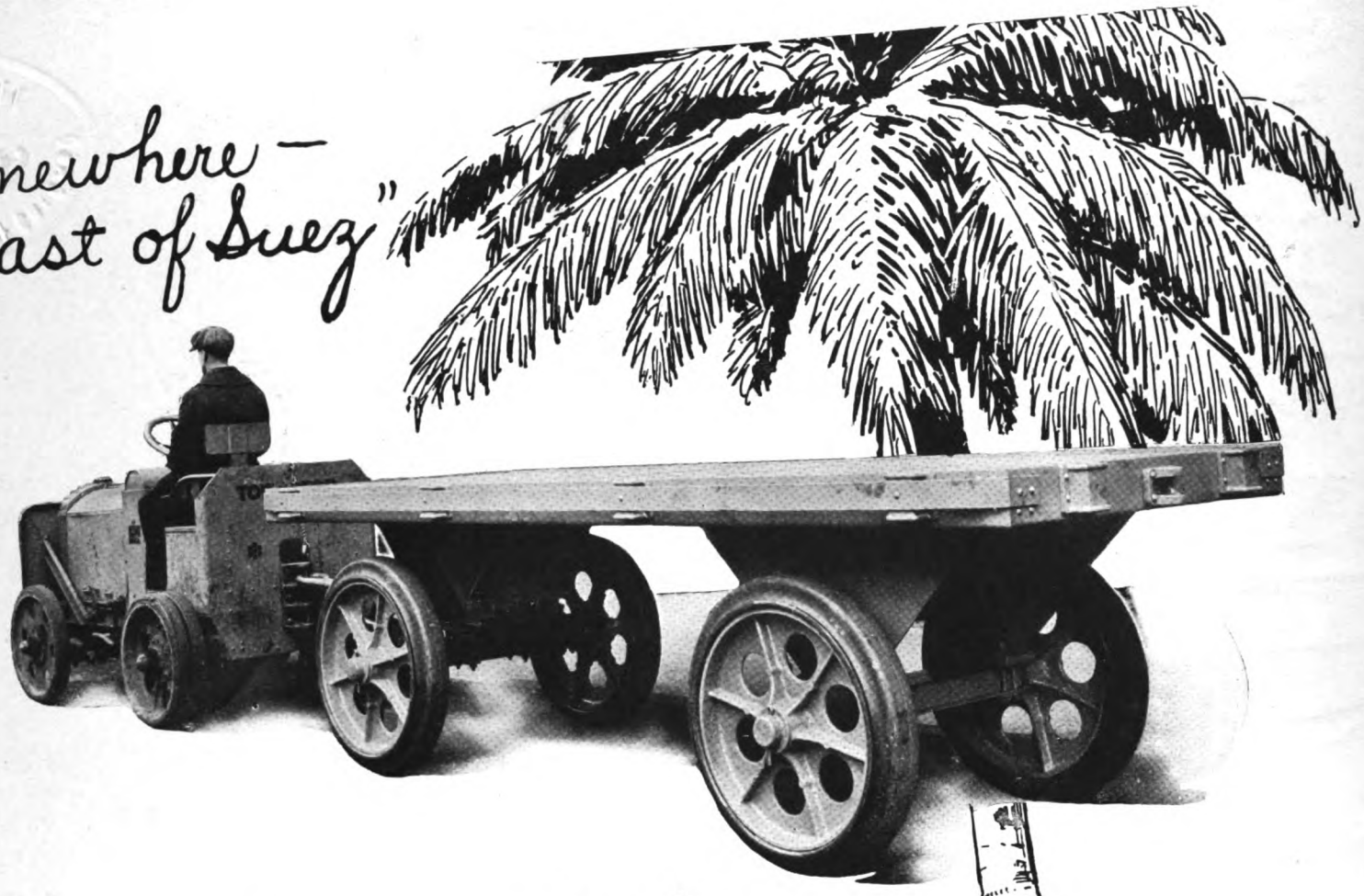
Industry Illustrated

Men, Methods and Machinery of Modern Management

Reg. U.S. Pat. Off.



Digitized by Google



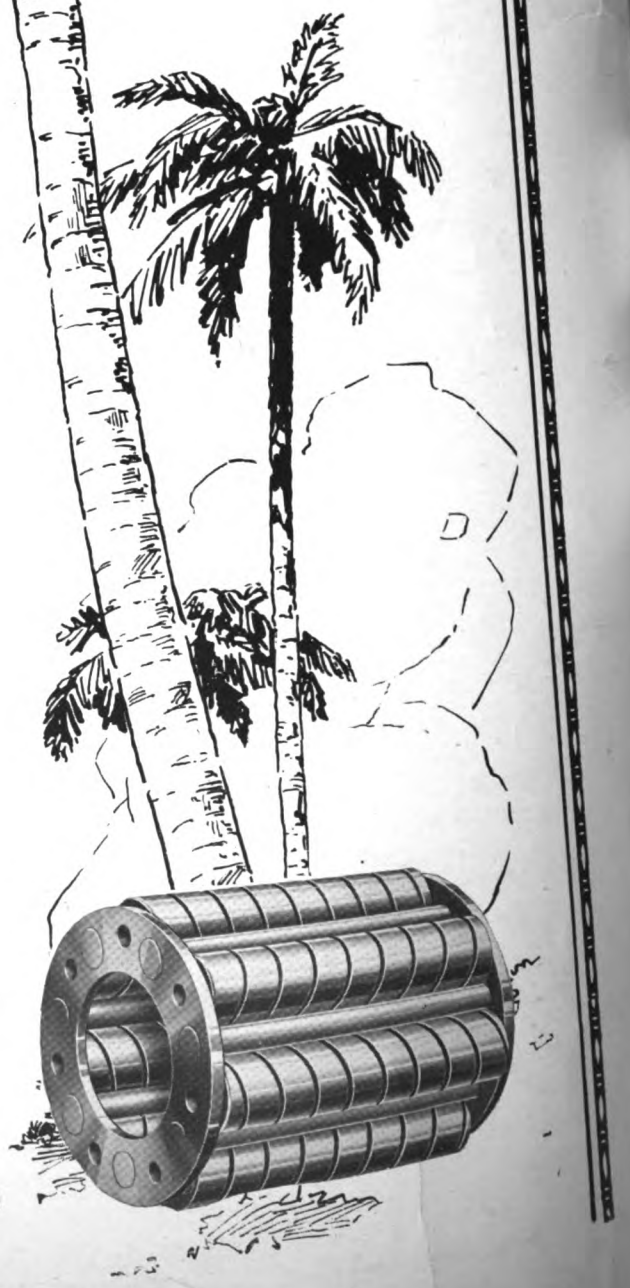
Hyatt Bearing Trailers Are Making Good

Eighteen of these husky, capable Hyatt bearing trailers are being operated by the Albion Dock Company, Port Louis, Mauritius Island (in the Indian Ocean).

To insure dependable trailer operation for this far off user the Towmotor Company of Cleveland built Hyatt roller bearings into their trailers. The elimination of bearing adjustment or replacement, so important to all trailer users, is of especial importance to a firm half way around the world from the source of equipment.

Dependability was of course the first consideration for this equipment but the additional Hyatt bearing advantages of easy running and lower lubricating cost are just as important.

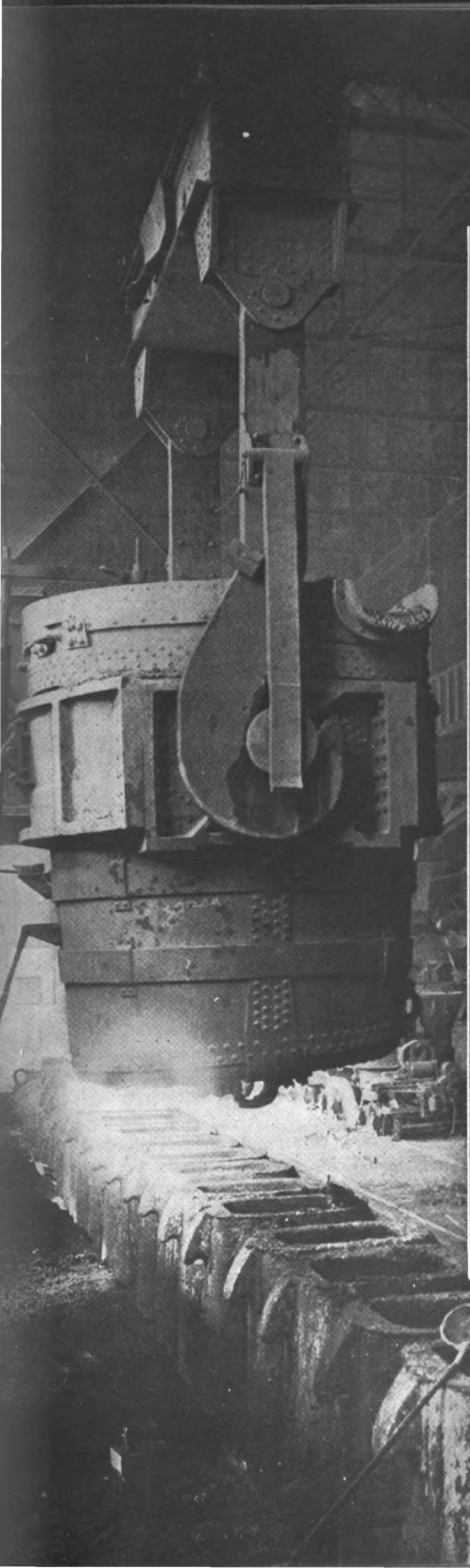
The dependability and economy of Hyatt roller bearing trailers will materially reduce *your* handling costs—specify Hyatt equipped. All reputable trailer manufacturers are prepared to furnish you Hyatt bearing trailers.



HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago San Francisco
Worcester Milwaukee Huntington Minneapolis Philadelphia
Cleveland Pittsburgh Buffalo Indianapolis

Digitized by Google



INDUSTRY ILLUSTRATED

CONTENTS

May, 1923

Editorial—Buried Treasure Page 7

Production *Plus* 8

By John H. Van Deventer—Machining Operations at Ford's River Rouge Plant

A "New" Science, More Than Five Generations Old 14

By Matthew W. Potts—The Comparatively Slow Progress Made in Materials Handling in 128 Years

Feed Water Treatment 18

By James T. Beard, 2nd—The Economies Possible Through Proper Equipment

Promoting Team Work Through Athletics 21

By D. G. Baird—How Studebaker Has Reduced Labor Turnover and Increased Production, by Fostering Sports

The Future of Belt Conveying 22

By Frederick V. Hetzel—The Vast Progress of the Last Few Years, and What It Presages

The Deserted Power House 26

By Oliver S. Arata—The Sub-Station that Does Its Own Thinking

The Pot of Gold Under Our Hats 58

By Frederick H. McDonald—A Workable Recipe for Business Success

Pitfalls of Employment Contracts 79

By Leslie Childs

On page 81 will be found a list of those concerns to whose courtesy we are indebted for photographs in this issue not otherwise credited.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.

Founded 1891 by

JOHN R. DUNLAP

Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* HARVEY CONOVER, JR., *Vice President*

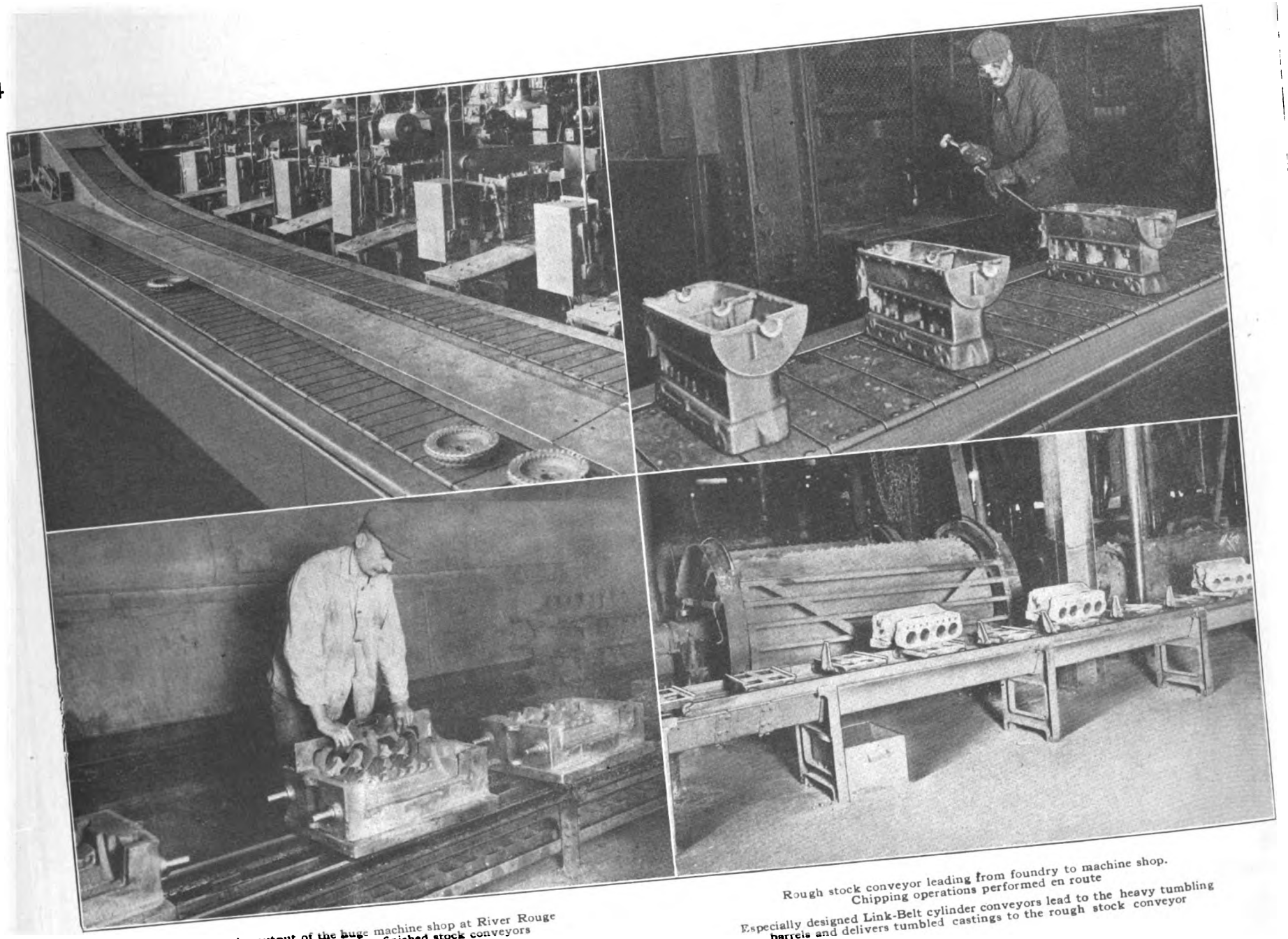
JOHN R. DUNLAP, JR., *Secretary*

Vol. 4, No. 5 Subscription price $1.00 per year; single copies 10 cents.

Copyright, 1923, by The Engineering Magazine Co., in both the United States and Great Britain.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y., Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

Digitized by Google



The entire output of the huge machine shop at River Rouge is transported on these two finished stock conveyors

Portion of one of the seven heavy "drag systems" on which Ford cylinder molds are constructed "on the move"

Rough stock conveyor leading from foundry to machine shop. Chipping operations performed en route

Especially designed Link-Belt cylinder conveyors lead to the heavy tumbling barrels and delivers tumbled castings to the rough stock conveyor

Link-Belt Conveyors at Ford Plant

Shop transportation has been brought to the highest degree of perfection and efficiency at the Ford Plant.

The cost of handling the rough and finished castings for 500 Fordson Tractors and 500 Ford Car Cylinder Blocks which are machined every 24 hours, has been cut to the minimum.

From the foundry on through the machine shop, to the shipping platforms, Link-Belt Conveyors handle this enormous production, resulting in the elimination of transient storage and trucking.

Thus the square-foot floor space over-head, and investment in stock-in-process, are both reduced to the absolute minimum.

The co-operation we were able to give the Ford Engineers in helping them towards efficient material handling and labor-aiding methods is available to every manufacturer desirous of cutting his overhead. The Link-Belt line covers material handling equipment of all types, elevators and conveyors, locomotive cranes, crawler cranes, electric hoists, portable loaders, etc. Let our engineers show you how Link-Belt equipment can effect similar results for you. Send for catalogs.

LINK-BELT COMPANY
CHICAGO, 300 W. Pershing Road

PHILADELPHIA, 7045 Hunting Park Ave.
New York, Woolworth Bldg. · Boston 9, 49 Federal St. · Pittsburgh, 335 Fifth Ave. · St. Louis, Central Nat'l Bank Bldg.
Buffalo, 745 Ellicott Square · Wilkes-Barre, 2d Nat'l Bank Bldg. · Huntington, W. Va., Robeson-Prichard Bldg. · Cleveland, 429 Kirby Bldg.
Detroit, 4210 Woodward Ave. · Kansas City, Mo., 306 Elmhurst Bldg. · Seattle, 820 First Ave., S. · Portland, Ore., 101 First St.
San Francisco, 168 Second St. · Los Angeles, 163 No. Los Angeles St. · Denver, Lindrooth, Shubart & Co., Boston Bldg. · Atlanta, 610-611 Citizens and S'thrn. Bk. Bldg.
INDIANAPOLIS, Belmont Ave. at Big Four R. R.
Louisville, Ky., Frederick Wehle, Stark-Bldg · New Orleans, C. O. Hinz, 504 Carondelet Bldg. · Birmingham, Ala., S. L. Morrow, 720 Brown-Marx Bldg.
DALLAS, TEXAS, 709 Main St.
Canadian Link-Belt Co., Ltd., Toronto and Montreal
H. W. CALDWELL & SON CO., CHICAGO NEW YORK, Woolworth Bldg

LINK-BELT

Digitized by Google



The Most Interesting Job in the World

"What shall my lifework be—what career shall I choose?" This is the most absorbing question which confronts the young man of to-day.

Perhaps we can help you answer this question by asking another "What do you expect your career to bring to you?"

First of all, you expect money—not just a living wage, but enough to enjoy the luxuries that make life worth while.

Secondly, you want power. There is no joy like the consciousness of ability to control a great organization at work—no happiness like knowing that you are shaping the course of human events, not being shaped by them.

Finally you expect you career to interest you—for unless your whole heart is in it, you will never win success.

To most young men a professional career is attractive. But the older professions are all over-crowded. In the fields of law engineering, medicine, etc., competition is keen. There are more men than there are jobs.

A BRAND NEW PROFESSION

But there is a profession which is *not* overcrowded—a brand new profession—one of the most fascinating and absorbing in the world—a profession which pays large salaries and which calls for the exercise of executive ability on a big scale. The profession is "Industrial Engineering and Management."

Canada is the land of industrial enterprise. And industry needs Managers—men trained to handle big industrial organizations. Such men are hard to find. There are more jobs that there are men to fill them. For Factory Management demands not specialized knowledge, but a well rounded training in fundamentals. It requires the type of man who understands all departments of an organization, one who knows the basic principles which govern factory organization and administration, the planning and routing of work, wage systems and bonus plans, cost accounting, the generation and use of power, the selection of factory sites, layout and use of equipment, and all of the many other vital factors with which the effective industrial manager of to-day must be familiar.

ONCE IN A DECADE

Only once in a decade is a new profession inaugurated. Today *you* have the chance to make Industrial Engineering your profession and life work.

The Industrial Extension Institute specializes in training men to become Industrial Managers. It does this through an organized Course of home study known as the "Factory Management Course and Service," consisting of lecturers, text books, talks, reading assignments, problems and model solutions to these problems.

One hundred leading industrial specialists, men like Gantt, Twyford, Babson, Steinmetz, Ficker, Franklin, Going, Towne, Hunt, etc., have co-operated to produce this unique course of training. Their combined experience is arranged in a non-technical way, so that you can benefit greatly by it.

HUNDREDS HAVE BEEN HELPED

The principles of Factory Management are not hard to master when they are arranged in logical sequence through an organized Course of Study. Thousands of men in great industrial plants such as The International Paper Company, The American Cotton Oil Company, The Curtis Areoplane Motor Company, The Crocker Wheeler Company, The International Motor Company, etc., have enrolled for the "Factory Management Course and Service" and forging ahead to the bigger jobs and larger responsibilities which lie before them. It can help you too. Decide today to qualify for the most interesting job in the world. Start preparing right now to be one of the industrial managers or industrial consultants of to-morrow.

We have an interesting little booklet *"Thinking Beyond Your Job"* which answers all the questions you want to ask about the wonderful new profession, and explains in detail, how you can fit yourself for an important managerial position.

Tear off the coupon below and send for it—it is free.

Industrial Extension Institute

11-17 East 45th St. **New York N. Y.**

The only Complete Course in Industrial Management

Industrial Extension Institute
11-17 East Forty-fifth St.,
New York City.

Send me "Thinking Beyond Your Job" without obligations.

Name .....

Home Address .....

Position .....

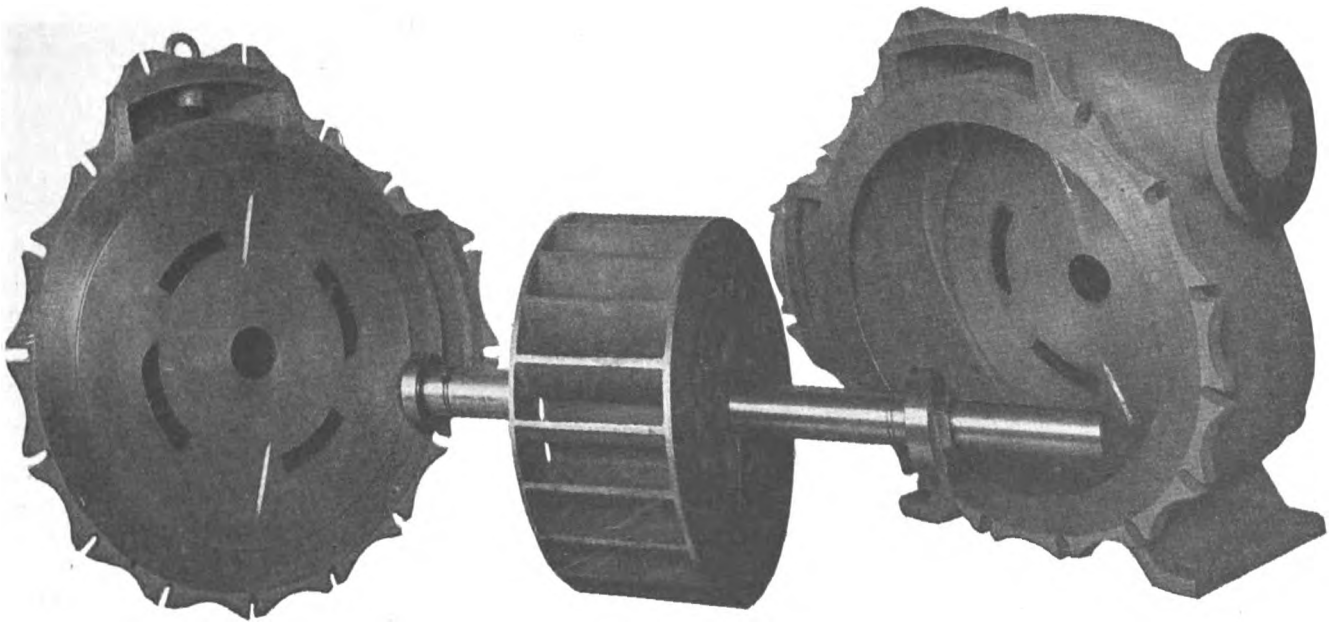
Company .....

Ind. Ill. May 1923

Digitized by Google

NASH HYTOR

THE ECONOMICAL AIR COMPRESSOR AND VACUUM PUMP



ALL THE PARTS OF THE HYTOR

THE HYTOR COMPRESSOR is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

The rotor, the only moving part, is cast in one piece, the blades being rigidly reinforced by shrouds. The rotor is mounted on a short, stiff shaft supported at each end by the highest grade annular ball bearings mounted outside of the casing.

As the peripheral clearance is large, there is no possibility of the ends of the rotor blades coming in contact with the casing.

The original high efficiency is maintained indefinitely in continuous service.

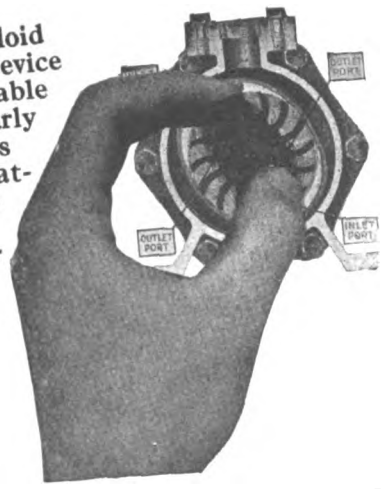
The air is thoroughly washed during compression and contains no oil.

Hytor compressors occupy very much less floor space and are much lighter in weight than reciprocating compressors They run without vibration.

The cost of installation is greatly reduced as no expensive foundations are necessary.

No expert attendance is required as there are no adjustments to make. The cost of upkeep is negligible.

Hytor compressors are quiet in operation.

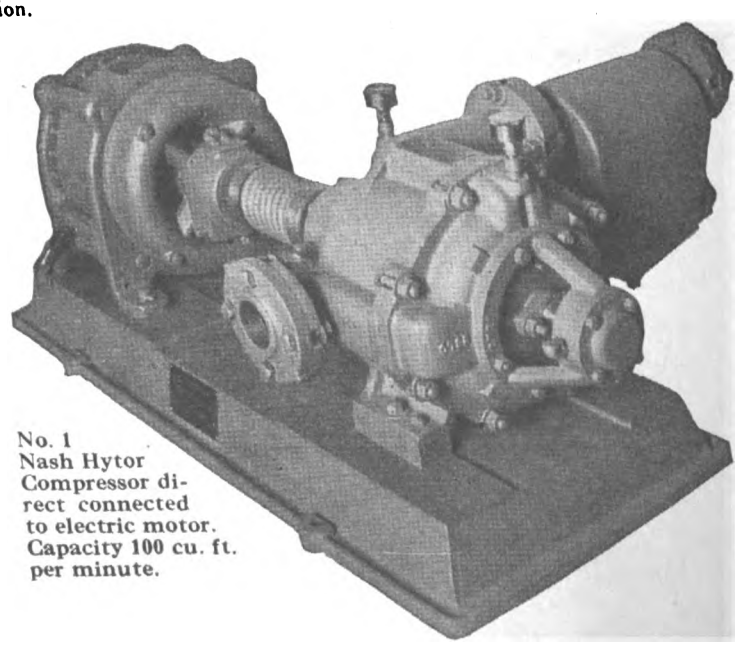


This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

At pressures up to and including 15 lbs. per square inch, and vacuums up to 20 inches of mercury, the Nash Hytor affords the simplest and most economical means for handling air or gas, for all of the usual purposes where air under pressure is required, and they can be used on many special services for which the ordinary compressor is not adapted.

It is common practice in handling mildly acid vapors to re-circulate thru the pump an alkaline solution for the protection of the cast iron structure of the pump. In handling chlorine gas, concentrated sulphuric acid is re-circulated.

Air handled by the Hytor is delivered absolutely clean and free from dust or oil; a great advantage in the agitation of good products or in absorption processes where diffusion of air is accomplished by blowing thru filters, porous blankets or small orifices.



No. 1 Nash Hytor Compressor direct connected to electric motor. Capacity 100 cu. ft. per minute.

3

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps
- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps

NAME.....
POSITION.....
COMPANY.....
ADDRESS.....

NASH ENGINEERING CO.
SO. NORWALK, CONN., U. S. A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate Editor

Adolf Schildkraut, Art Director

EDITORIAL

Buried Treasure

WE have scanned carefully the list of articles discovered in the three thousand year old tomb at Luxor. There are references to finely wrought thrones, chariots, alabaster vases—a wide variety of things; but, so far as present reports go, the discoverers found no conveyors, or cranes, or elevators.

The thought is by no means as fantastic as it may seem at first glance. The wheeled chariots, the furniture, and the textiles entombed with this Egyptian Pharaon, bear mute witness to the craftmanship and skill of this civilization of some thirty centuries ago. We know, moreover, that the building of the Pyramids would constitute a task of major proportions even today, with the aid of modern machinery. How these immense monuments were constructed; how the huge blocks of stone were quarried, shaped, transported, and set in place; these are things which we do not yet know with any degree of certainty.

Certain it is, however, that many discoveries and inventions of ancient times have been lost to mankind, through bigotry, vanity, or indifference. The much discussed "Pompeian red" is an example; another is the art of tempering copper; still another, the making of resilient glass.

The up-to-date manufacturer, when he thinks of these things, has but contempt for "those old fellows" who, through ignorance or mental laziness, or lack of appreciation, failed to cultivate and to promote such valuable inventions. But tolerance, like charity, might begin nearer home; for that same ignorance and mental laziness is just as much in evidence in the present century, as in all the centuries that went before.

Right here, in our own progressive country, is a glaring example of this. We have grown accustomed to thinking of the science of materials handling as a new science—a development of the past thirty, or at most, forty years. Yet, if you will turn to the article which appears on page 14 of this issue, you will discover that belt conveyors, screw conveyors and elevators were not only invented, but were in actual use in grain mills in this country one hundred and twenty-eight years ago.

Not only was this materials handling equipment in use, but it had already proved its power to save money, time and labor, away back in 1795. What, then, accounts for the failure to extend and promote its use; why was there so little advance made in a whole century; why did not the coming of steam power make the use of materials handling equipment universal?

It is safe to say that not one man in a thousand who reads these lines, but is thoroughly informed on the discoveries made in the tomb of a king who died over three thousand years ago. We are inclined to suspect that it is equally safe to say that not one in one hundred, of our executive readers, is thoroughly informed on the much more immediate and profitable discoveries that would result from a close scrutiny of the materials handling methods right in his own plant.

Digitized by Google

Production Plus

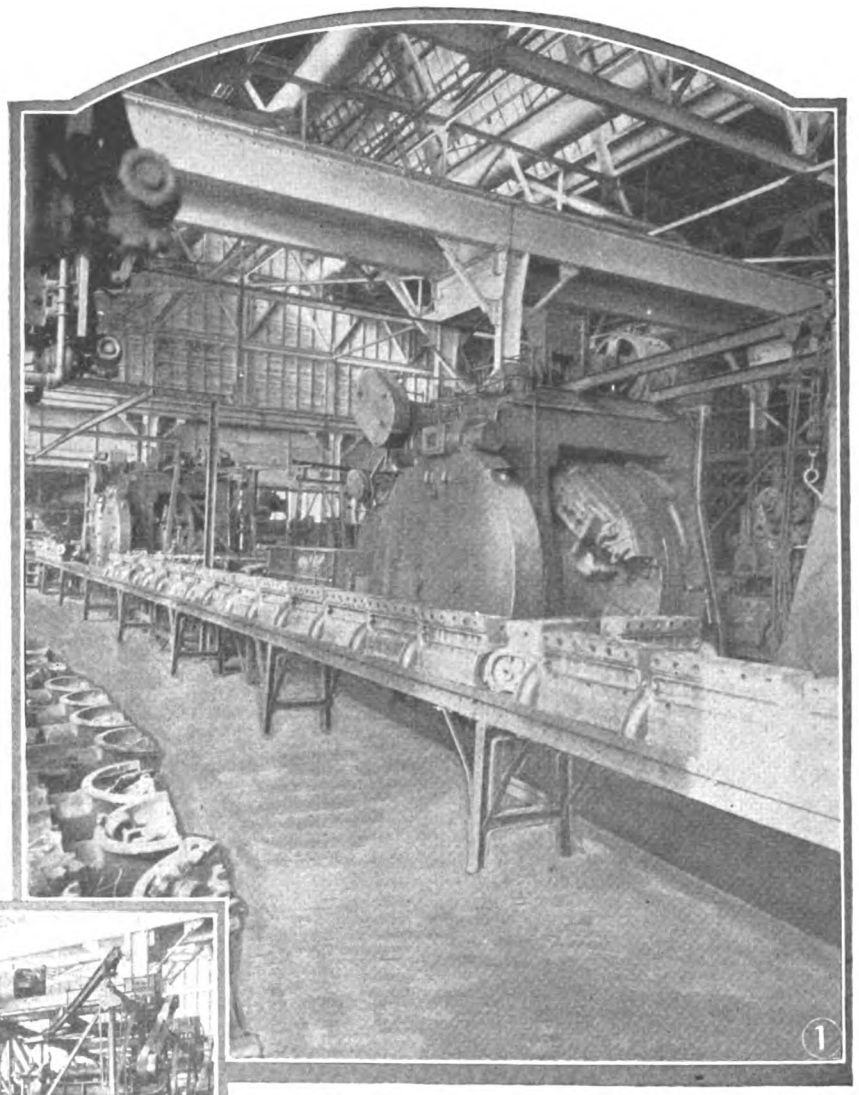
Machining Operations at Ford's River Rouge Plant

BY JOHN H. VAN DEVENTER

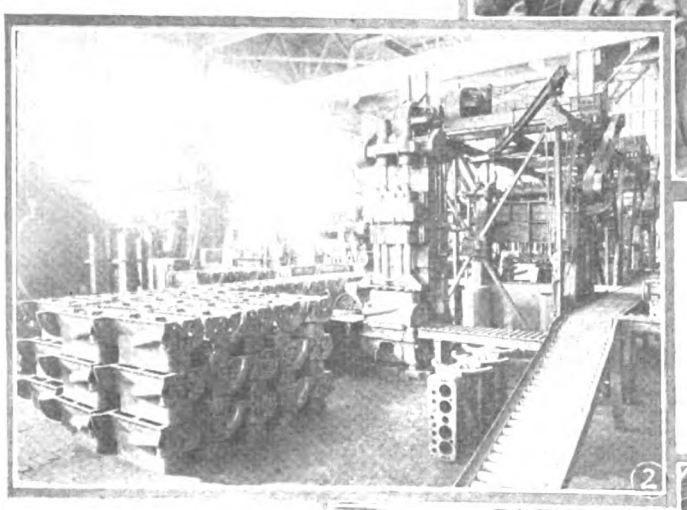
ONE becomes accustomed to encountering the unusual at the plants of the Ford Motor Company and also to finding substantial reasons for things being done as they are done. It is rather unusual to find a machine shop housed in the same building with a foundry. All of the iron castings produced at the River Rouge foundry, where fifteen hundred tons of metal are poured daily, are machined under the roof of the same building in which these castings are molded. This relationship, however, is a logical one when you consider the Ford principle of maintaining production in uninterrupted flowing streams from start to finish so far as possible.

In a previous article* we followed the course of production in the making of castings and found it an unbroken chain from the origin of the embryo core to the finished casting, ready to be machined. Our present story begins where the last one terminated, and takes the casting via an almost uninterrupted system of conveyors through the machining operations to the car loading platform which forms the connecting link with assembly.

The machine department at River Rouge occupies a floor space of 150 by 1200 feet, running lengthwise of the eastern portion of the foundry building. It is separated from the foundry proper by walls through which openings are provided for the transportation of castings. Thus the machining area is actually a long rectangle flanked on either side by slat conveyors, which run nearly the entire length of the department. That on the western flank nearest the molding and cleaning operations is known as the rough stock conveyor. Both of these run from south to north. Between them are sharply defined groups of machine tools and appliances. Each group is devoted to the complete machining of a certain casting. Between the two long conveyors and running from west to east



Entering the machine shop at River Rouge from the foundry, Fordson cylinders travel on gravity roller conveyors to huge station type milling machines.

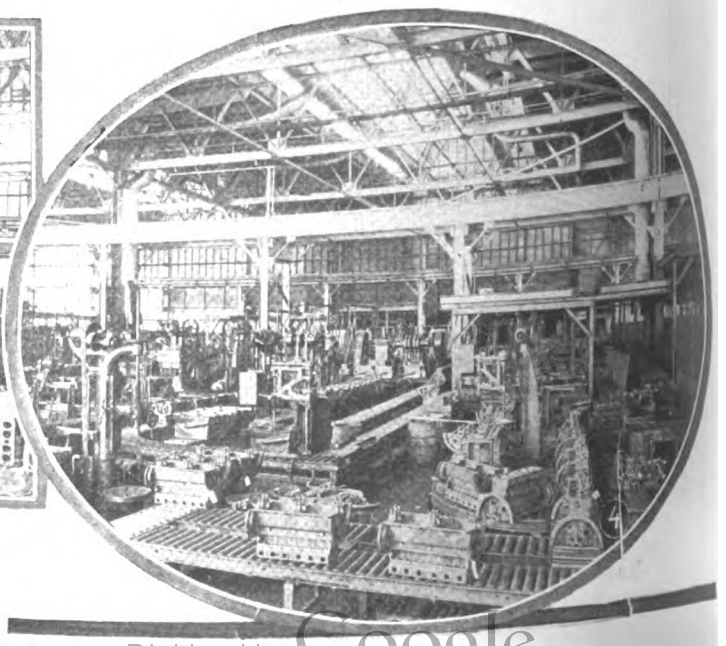


The tractor cylinders are bored and reamed on huge four-spindle boring machines. Note overhead works to facilitate handling the heavy castings.



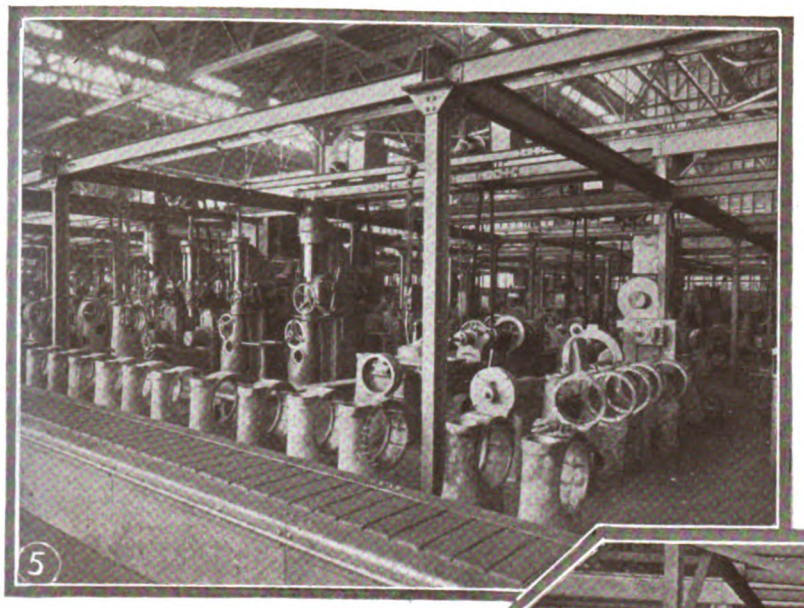
At the left of this picture are the tractor camshaft bearing drills, and at the right multi-spindle drills for tractor cylinder heads.

A study in inter-machine transportation. This is where the tractor bearing caps are babbitted.

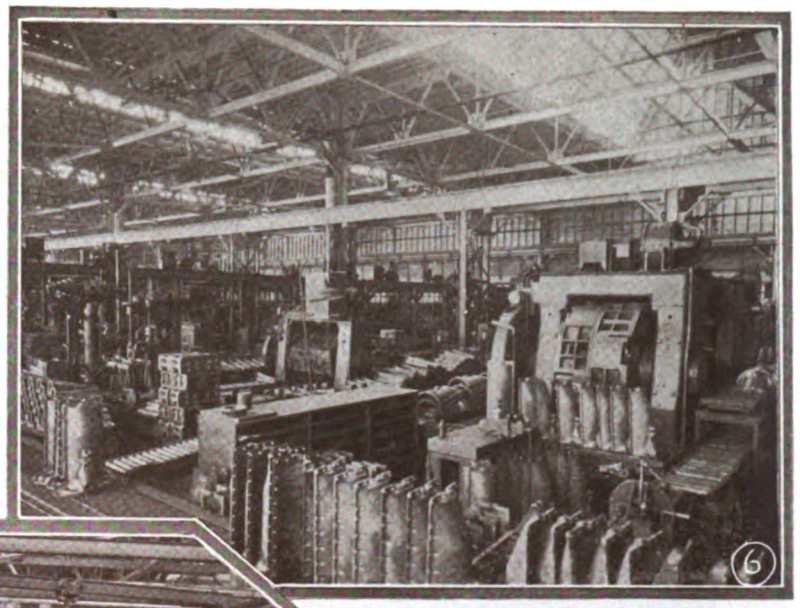


* INDUSTRY ILLUSTRATED, January, 1923.

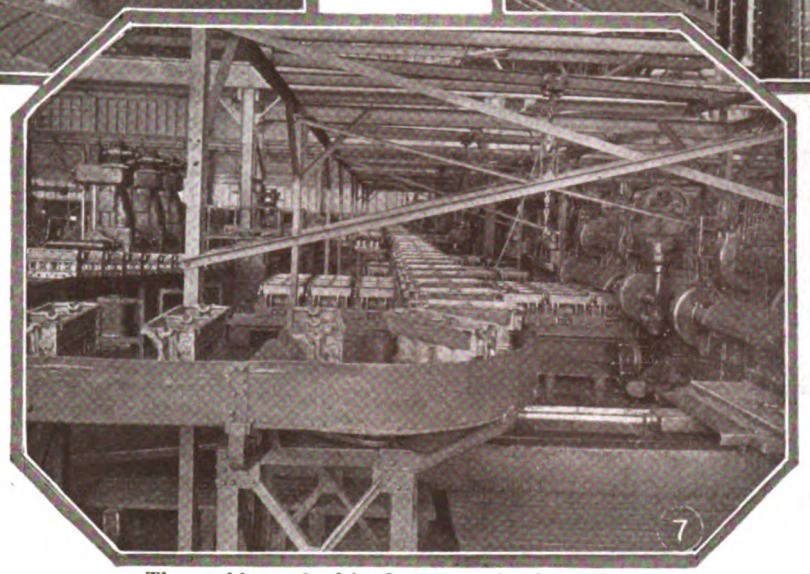
Digitized by Google



Next, one comes to the tractor transmission housing job, as it is called, where axle flanges and transmission seat are bored and faced.



At the left of this picture is the tractor cylinder machine unit, and on the right station-type millers for machining tractor crankcases.



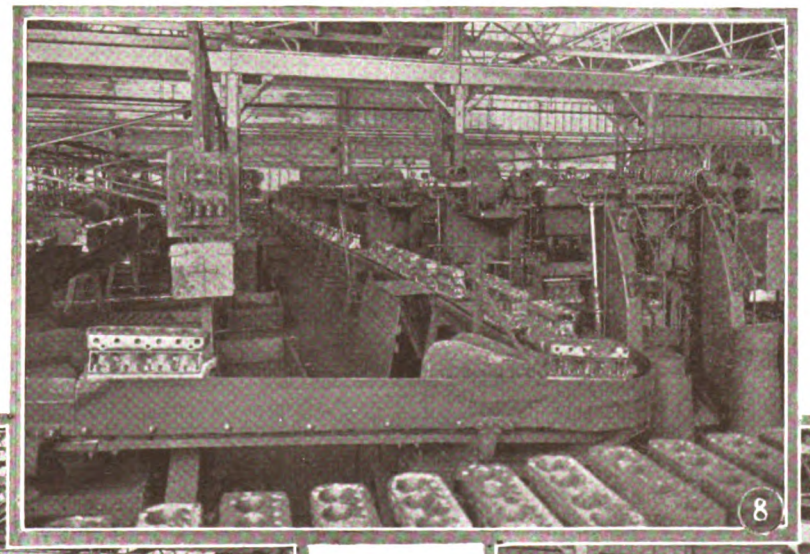
The tables of this battery of planer type millers run underneath the conveyor shown in the center of the picture. Note overhead works to facilitate machine loading.

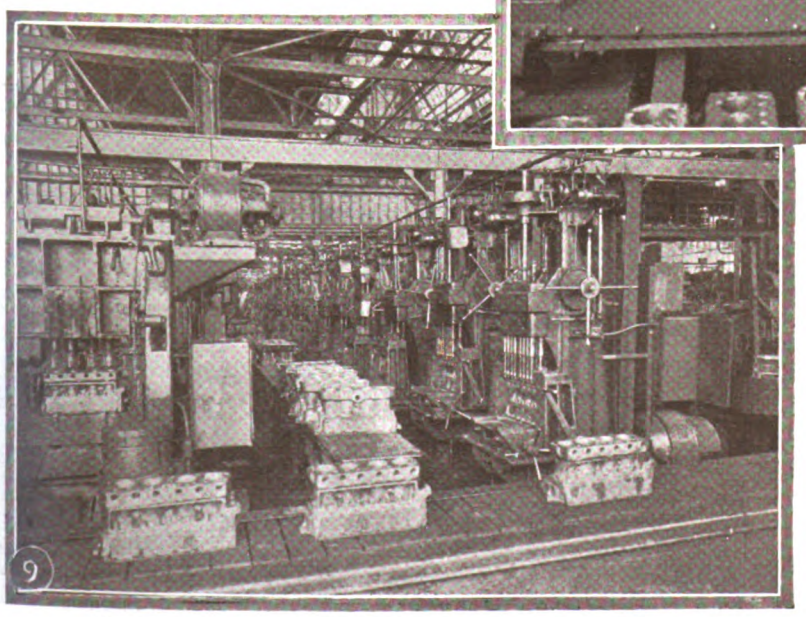
An endless procession of car cylinders passes by and feeds the battery of four-spindle boring machines which perform the rough boring operation.

are countless inter-machine conveyors which carry the work in process from the rough stock conveyor and from one machine to another until it reaches the finished stock conveyor in a completed state.

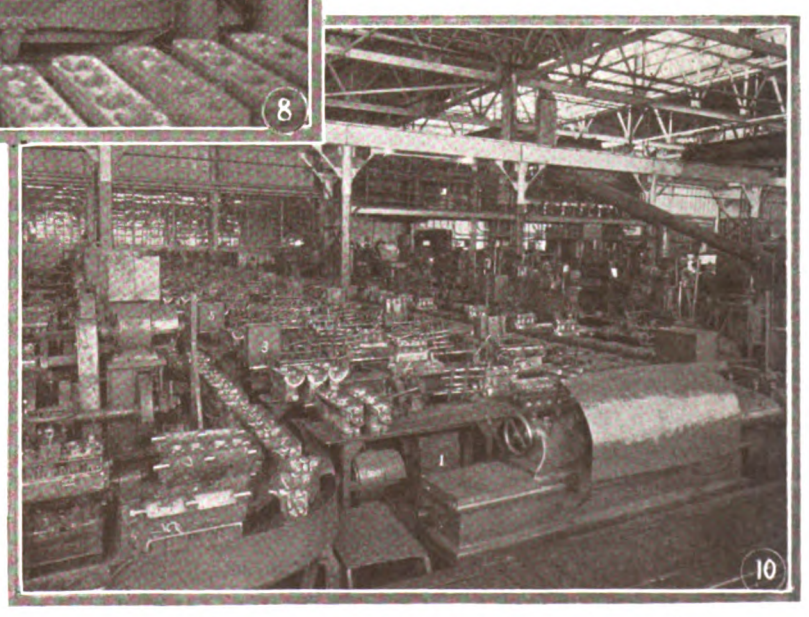
The first impression of the visitor at this machine shop and for one who inspects carefully the pictures presented here is that the machines have been placed so close together as to scarcely leave space for the men to operate them. One who is accustomed to usual machine shop practice would indeed call this a most congested area. This, too, has been done in accordance with a Ford principle —the principle that, so far as possible, the work must move and the men stand still. Employees of this company are not paid for pedestrian ability but for production. The less steps they have to take, the less time will be taken from production. And so practically all the steps are taken by conveyors which vary from elaborate, motor-driven, especially designed "easy chair" chain drags for the accommodation of cylinder blocks, to simple runways made of angle iron down which tractor pistons roll of their own weight.

The closer that machines can be placed, the less the total length of conveyors required for inter-machine work-handling. Thus, a saving of but six inches per machine is of utmost importance when a shop is dealing in production figures such as are dealt with here. Every twenty-four hours, complete castings are machined for five hundred Fordson tractors and in addition to this *five thousand cylinder blocks* for Ford cars pass through some forty-three separate operations. Hence, a square inch of vacant floor



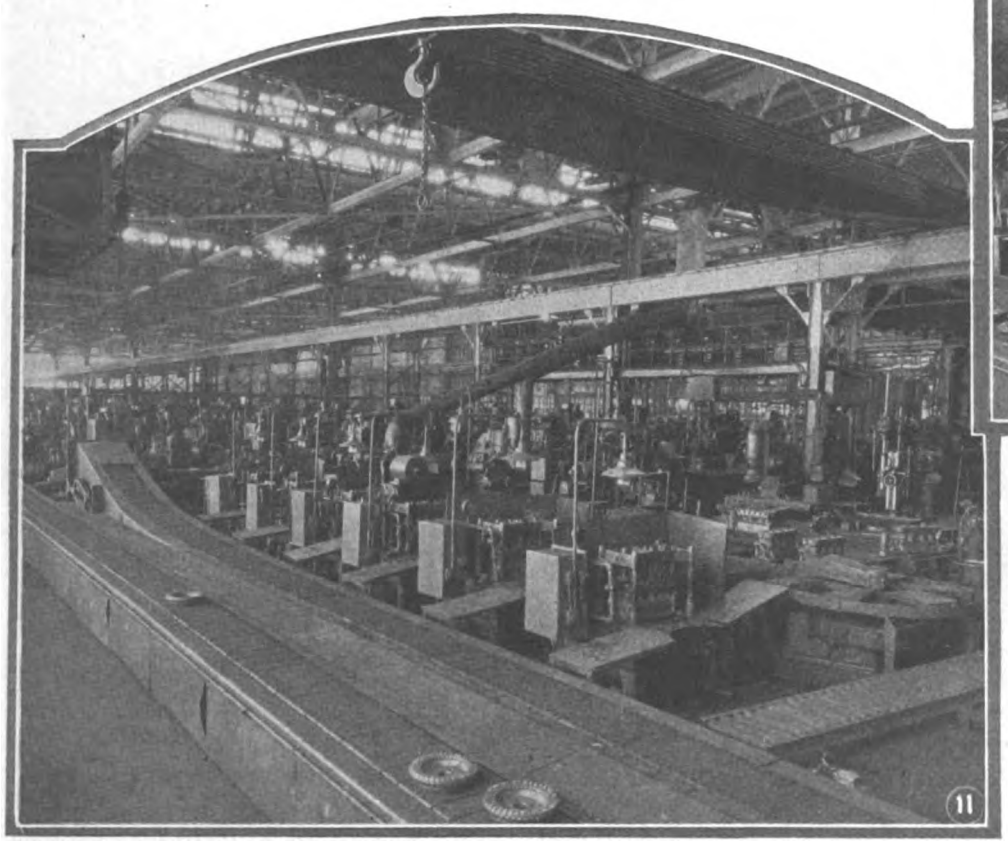


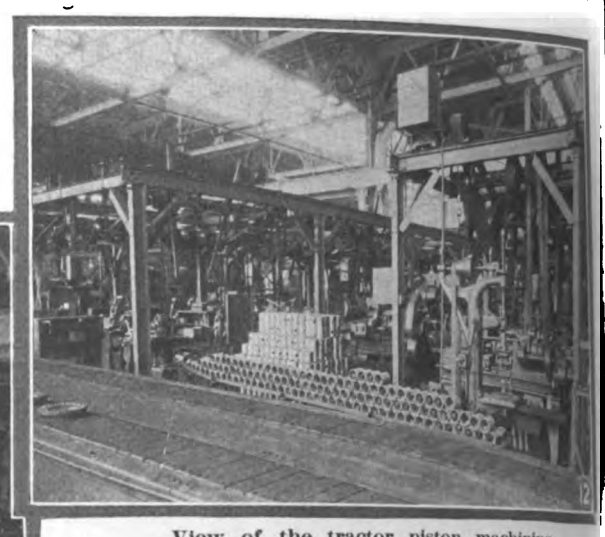
Push rod holes and valve stem holes on the T-400 are drilled and reamed on the battery of multi-spindle drills shown in this picture. At the left is the cylinder reaming operation.



A veritable forest of drills and reamers is pictured above. Here are the camshaft boring lathes for the Ford car cylinders.

Digitized by Google



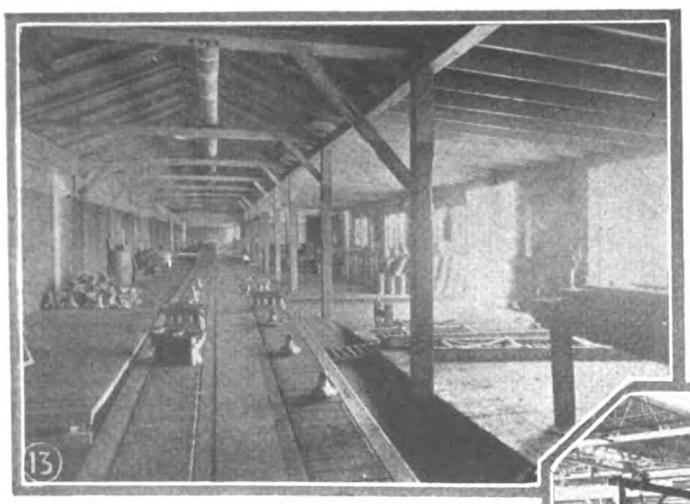


View of the tractor piston machining unit. Group drive is employed for the smaller machines, hence the overhead beam structures.

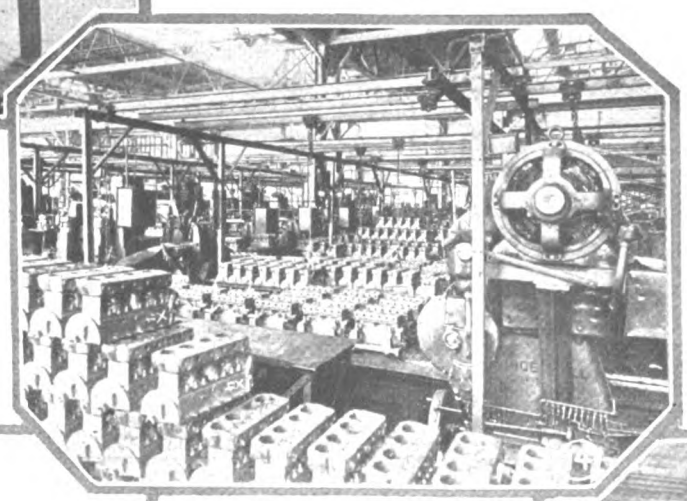
space is regarded as an enemy destructive to profits.

The first thirteen pictures which are presented in this article, were taken at successive points from south to north along the main aisle and adjacent to the eastern wall of the building. They are intended to give the reader the same impression as that received by a visitor who walks the length of the plant.

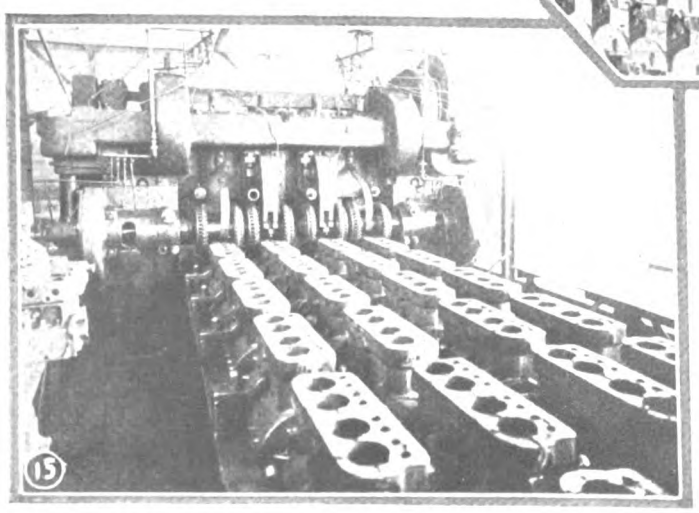
The first machining unit has to do with the tractor cylinder. In the first picture you can see a stream of these castings entering the machine shop from the foundry on a gravity roller conveyor. Inside of this conveyor are huge station-type milling machines where the cylinder tops are faced. Next we come to the boring operation performed on four-spindle boring machines. A good idea of the inter-machine conveying system is given by this second picture. In the third view we note a battery of cam shaft boring lathes and at the right of the picture multi spindle drills for drilling tappet and valve stem holes.



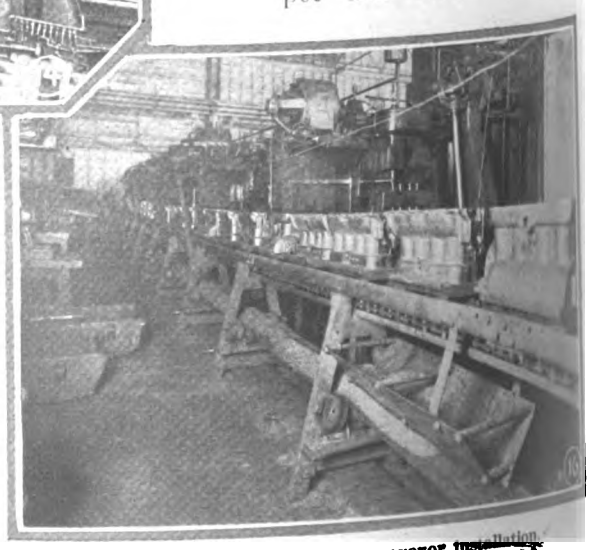
The wood slat conveyors in the foreground transport the entire output of finished work to the shipping platform. Just back of the second conveyor is the battery of hydraulic cylinder testing machines.



At the north end of the building the finished stock conveyors enter the shipping platform. Gravity roller conveyors on either side lead to car loading doors. Thousands of tons of finished castings pass through this place daily.



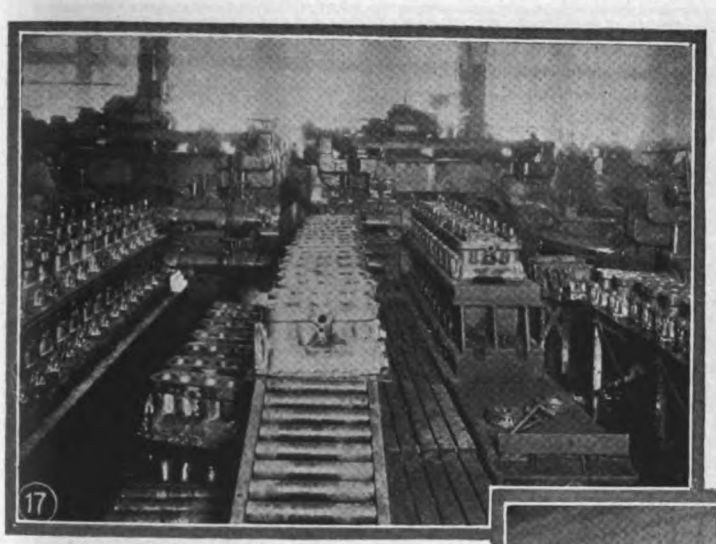
The second milling operation is done on the cylinder top and sides. This shows a battery of machines employed on this operation.



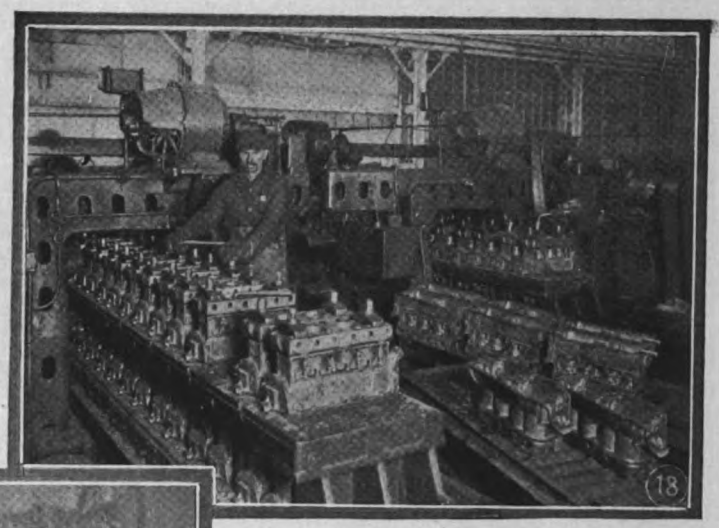
Work-holding fixtures are simple yet effective. All of the principle machine tools are equipped with multiple oiling systems

An interesting double conveyor installation. Underneath the chain drag conveyor which carries the cylinder blocks is a belt conveyor for disposing of chips.

Digitized by Google



Maximum utilization of floor space might well be the title of this picture. At the Ford machine shop the work moves and the men stand still.



Milling two sets of cylinder ends at one pass is effectively accomplished by means of a "second story" added to these miller tables.



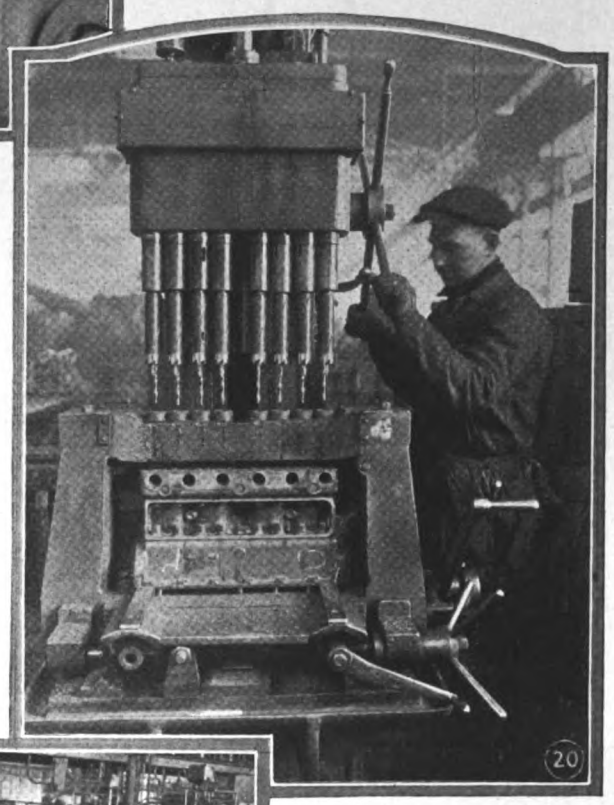
In the middle foreground is shown the special machine used for line reaming the crankshaft bearing hole.

Walking along a few yards further we come to the main bearing babbitting operation shown in Fig. 4. Notice that all of these conveyors are arranged to bring the work to the most convenient operating height.

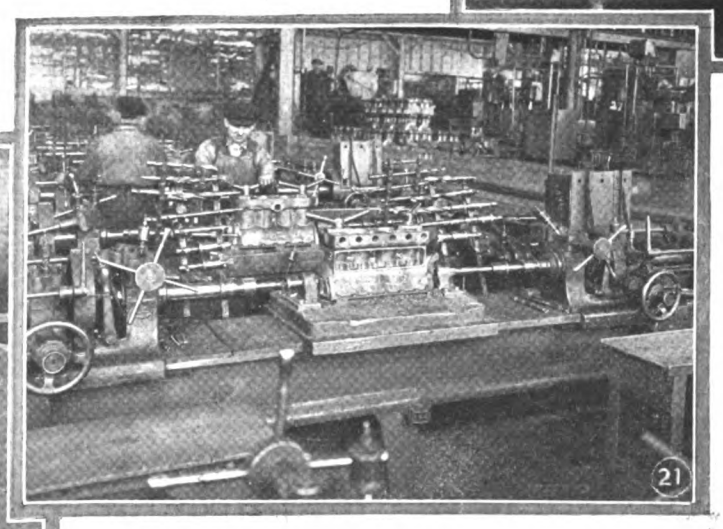
Passing along still further one sees a group of heavy single spindle boring machines engaged in boring and facing large diameter holes in the tractor transmission housings. As this section of floor space is devoted to castings of considerable weight, overhead handling facilities are provided to obviate hand lifting.

Just beyond the tractor transmission housing "job," as it is called, is a unit for machining the tractor crankcase. You can see this unit in Fig. 6 and also in the foreground the finished stock conveyor of which I spoke previously.

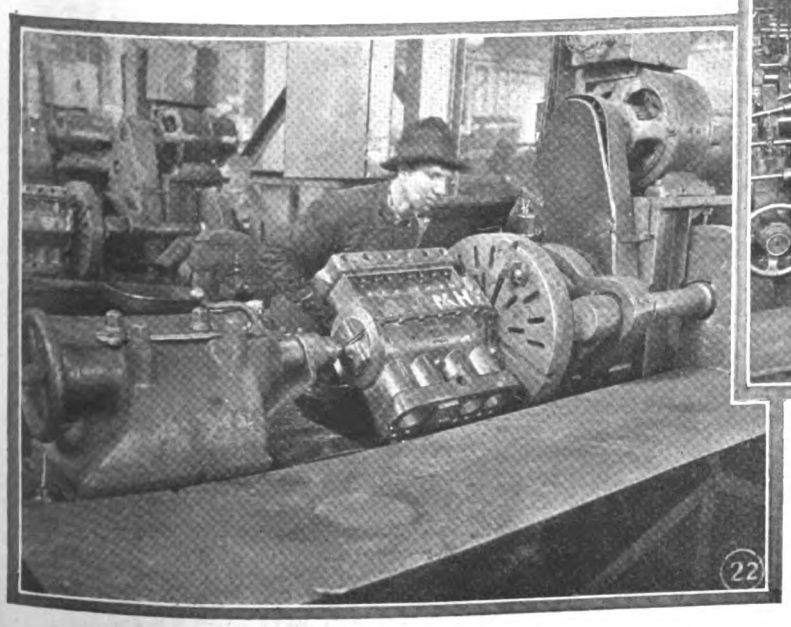
And now we come to what is the busiest and most interesting section of this busy and interesting machine shop—the unit which takes care of ma-



On this eight-spindle drill tappet holes are drilled and valve holes bored and faced.

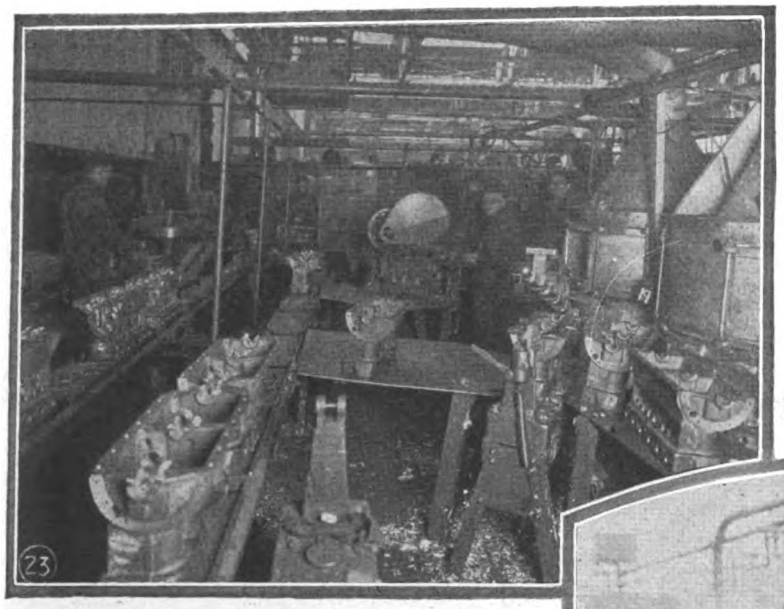


Drilling and reaming the T-cylinder camshaft hole is a delicate operation that required a succession of small holes. Note the convenient tool-holding racks.

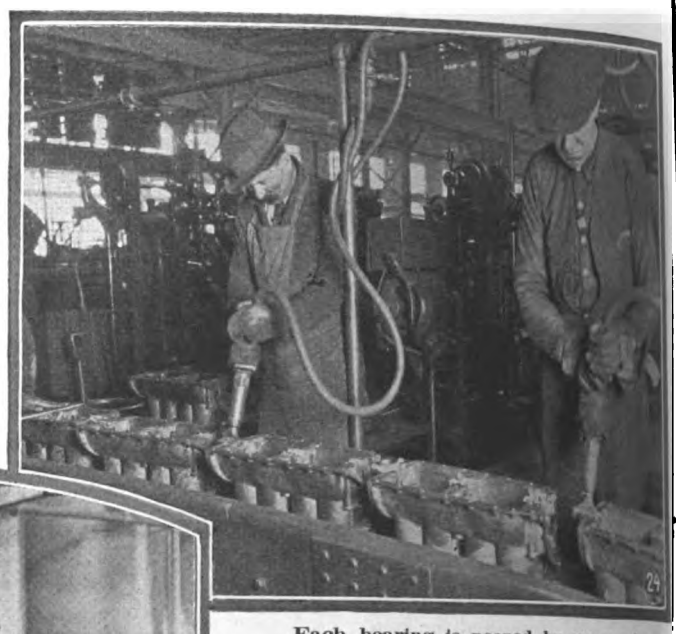


The transmission flange is turned and faced on two cylinders at a time securing perfect circular alignment with the camshaft bearings.

Digitized by Google

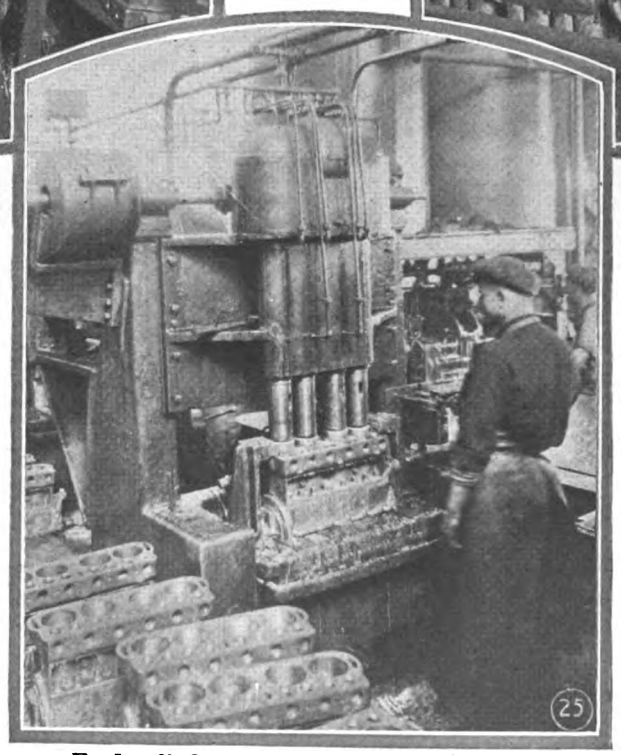


Fifteen thousand bearings are babbitted in this department every twenty-four hours. At the left are trimming machines which mill off fins and gates.



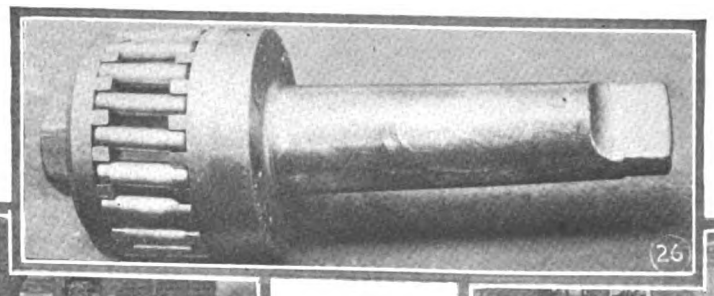
Each bearing is peened by means of a compressed air hammer as the cylinders pass this station.

chining five thousand car cylinder blocks every twenty-four hours. The visitor is introduced to this unit by a glimpse of the battery of milling machines shown in Fig. 7. An endless procession of cylinders pass over the tables of these machines, providing the operators with a continual supply of rough castings for this operation. Next in our preliminary inspection trip we come to a battery of four-spindle boring machines where the cylinder holes are rough bored. Here also you will see the same type of work-feeding conveyor system maintaining an endless procession of cylinders past these machines. The next vista that catches the eye is a literal forest of multi-spindle drills stretching as far as one can see. These are shown in Fig. 9 and here the drilling and reaming operations on the valve stem, tappet holes and



Ford cylinders are finished by rolling—not by cutting or reaming. This is really a swaging operation.

Here is one of the swaging tools that rolls the cylinder bore to its finished size, giving the metal a hard, glassy surface.

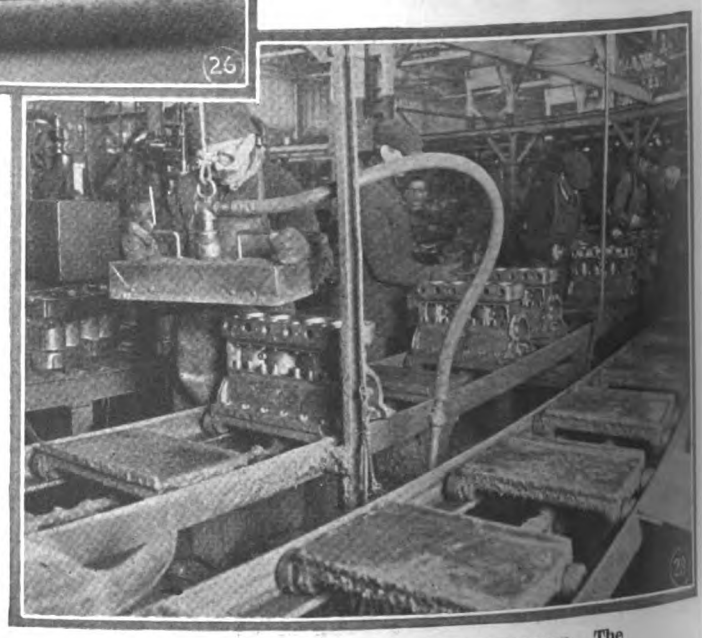


valve seats are performed. Each drill is provided with sixteen spindles, eight of which are in operation at a time; the two sets of spindles being utilized in succession by a lateral movement of the work-holding fixture. Here also you will note another form of conveying that reminds us of the ice slide of boyhood days. Work here is slid from one machine to another along a slippery sheet iron surface, elevated to work table height. The next picture, Fig. 10, represents the battery of camshaft hole boring machines that one encounters on walking some yards further. Notice how every square inch of floor space is utilized and how the work flows by on the various types of conveyors provided.

The next view in Fig. 11 is that which one would see by walking a hundred yards further north and then looking backward. In the foreground

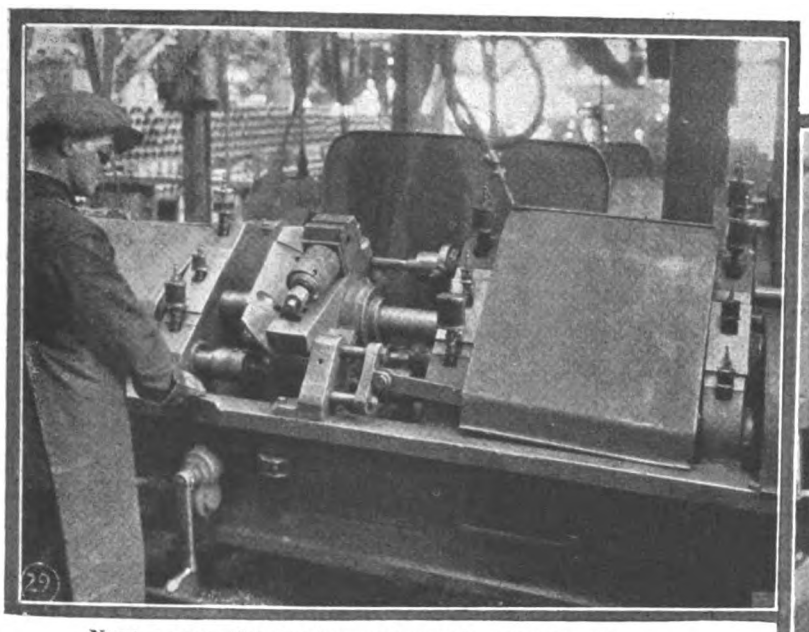


Near the end of their journey the T-cylinders pass through an automatic washing machine which removes oil and grease.



This is called the inspection conveyor. The operator at the left is blowing out the port cavities, and the inspectors at the right are checking up on size and finish.

Digitized by Google



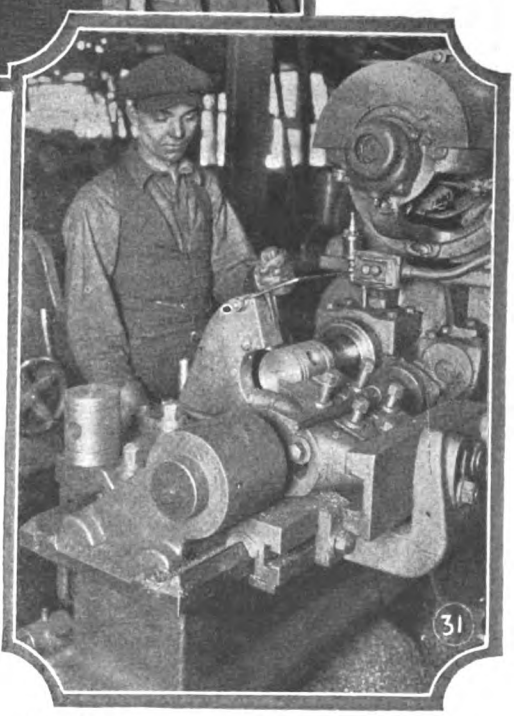
Next comes the boring and rough reaming of the piston pin hole.



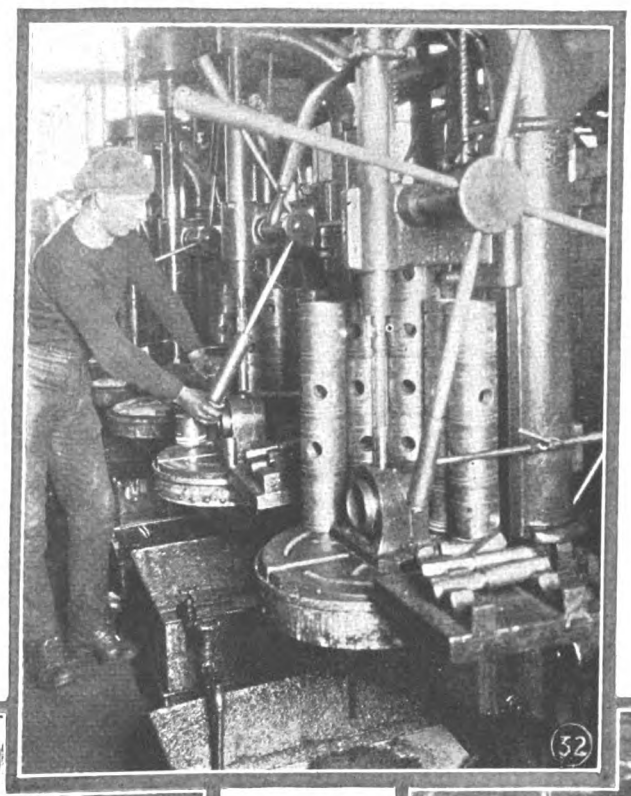
The rough turning, grooving and facing on the Fordson pistons is accomplished on a battery of automatics. At the right is the simple piston gravity conveyor made of two angle irons.

are the finished stock conveyors. The longer of the two stretches for nearly a third of a mile. Normally these conveyors present the appearance of an Atlantic City broadwalk procession with the difference, however, that the movement is in one direction only and of finished castings instead of people. This photograph was taken on a Sunday. After the last shift has gone off on Saturday night there is very little of accumulated left-over stock to be seen. This is a striking tribute to the ability of properly designed conveying systems to keep a plant cleaned up and thus to minimize the stock-in-process investment. Just back of the second conveyor in this picture is the battery of hydraulic testing machines where each cylinder is put under pressure to detect blow holes, leakage and porosities.

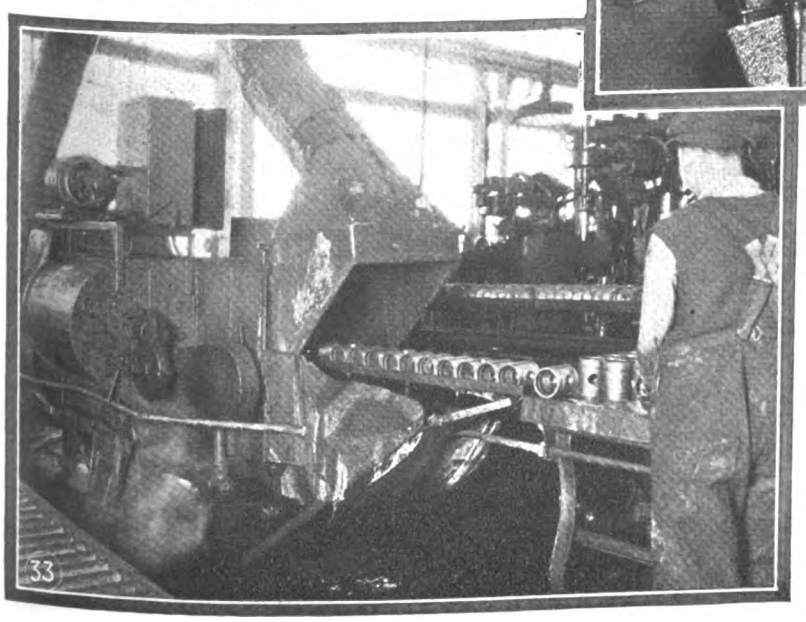
(*Continued on page 36*)



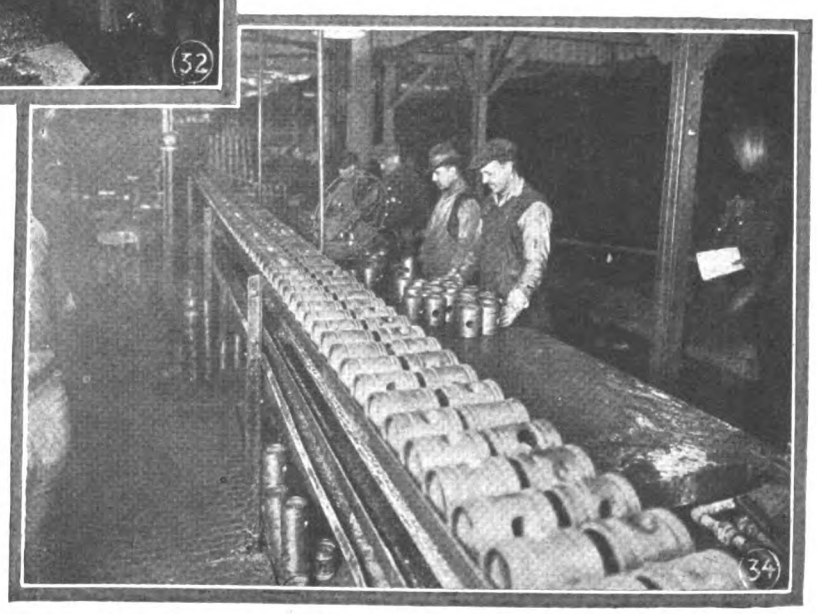
Rough turning the pistons is accomplished on the semi-automatic tool shown above.



Piston pin holes are line reamed to finished size on drills as shown at the left.



After the machining of the tractor pistons is complete they are passed through a washing machine and thoroughly cleansed.



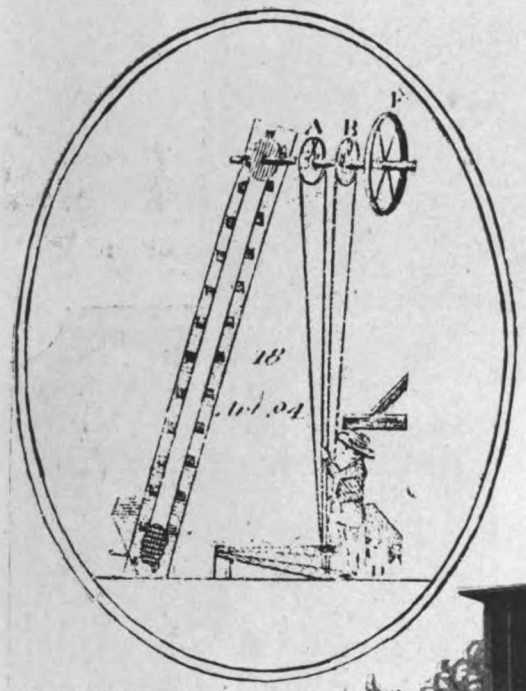
As the finished pistons roll past the inspection table they are checked for size and the piston rings are fitted.

Digitized by Google

A "New" Science, More Than Five Generations Old

The Comparatively Slow Progress Made In Materials Handling in 128 Years

BY MATTHEW W. POTTS



Man-power bucket elevator, as designed by Oliver Evans in the year 1795. It is crude but effective.

Materials handling is a subject that will be discussed by engineers and plant executives as long as production is a factor. The rush of war production made it necessary to turn to mechanical equipment to speed up the handling of materials in nearly every industry. In order to meet this demand, the manufacturers of materials handling equipment had to design and develop new types; which led to the belief, in the uninstructed mind, that the whole science was a new idea and an experiment.

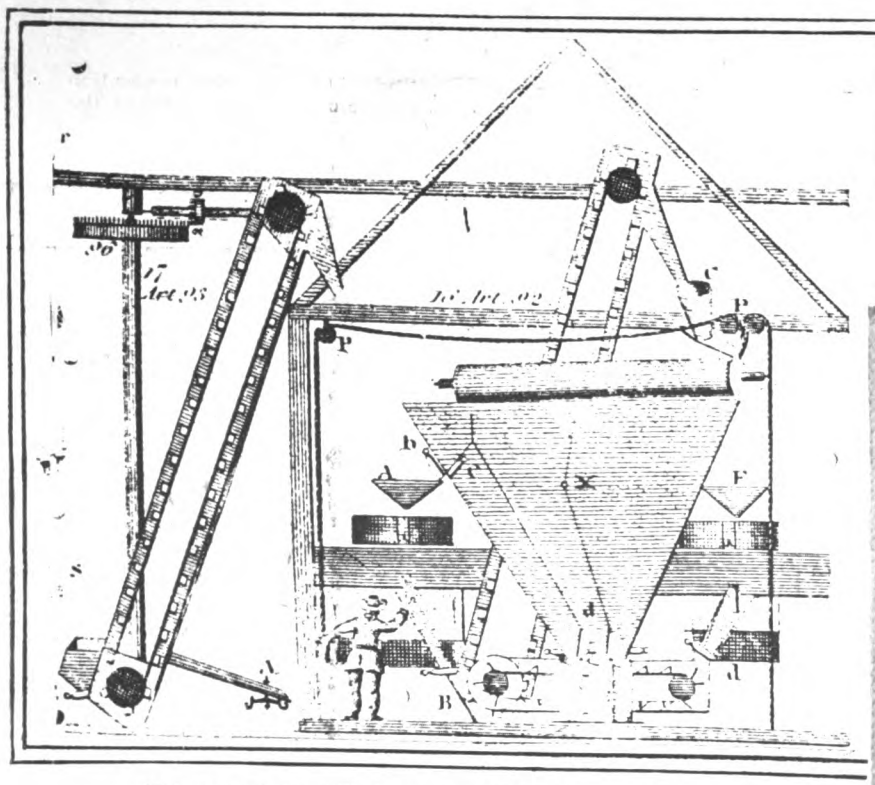
Illustrations on this, and the facing page, show very plainly that this is not so; that, in fact, the idea and its application have been known and used for more than a hundred years right within our own country. Looking at some of the more modern pieces of equipment, as illustrated, it will be seen that the principle of operation is the same.

To be sure, many new ideas have been added; but a search back through old engineering works has proven that it is difficult to find any really *new* development, other than mechanical improvements or fineness in construction details.

The manufacturers of this equipment now have a wonderful opportunity to promote the more extensive use of their

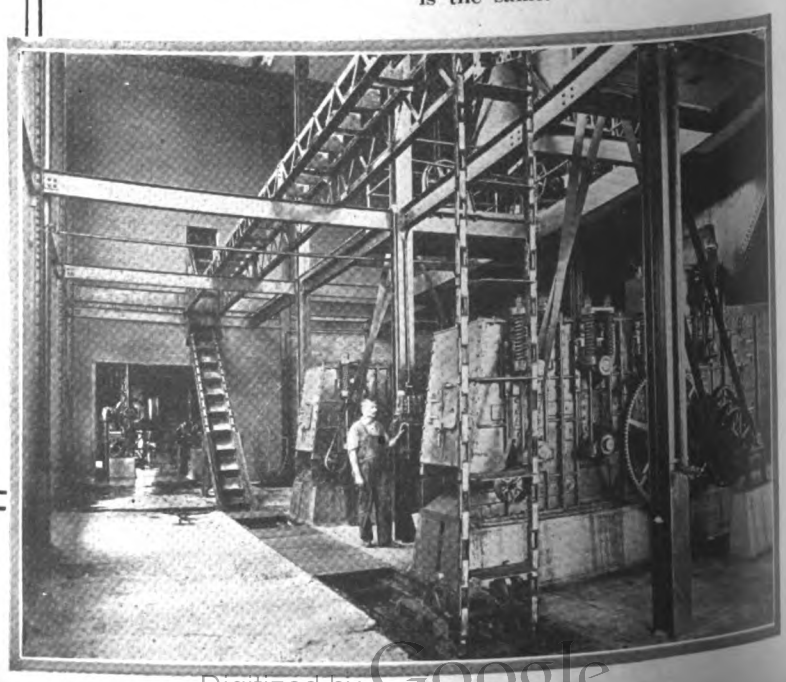


A modern plant. It is amazing, the diversity of places where materials handling equipment is called upon to operate. This picture was taken in the year 1921.

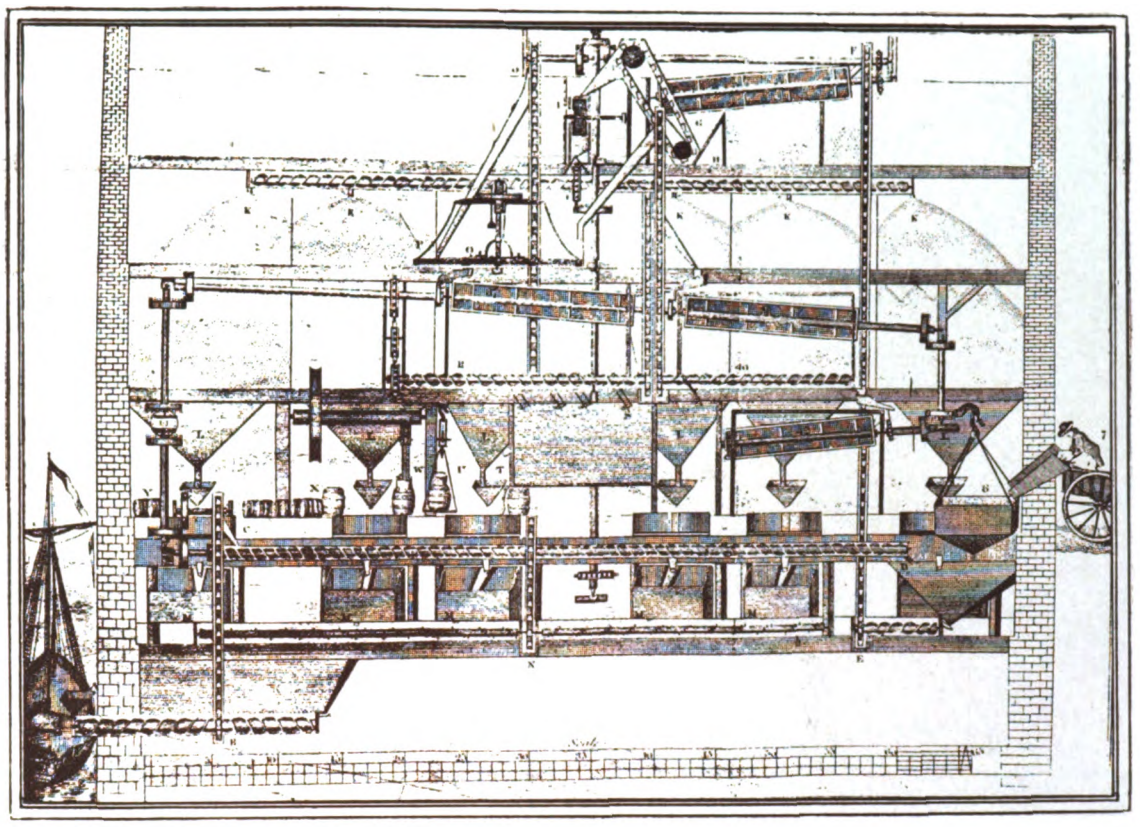


This complete mill is operated by one or two horse-power. Note the flight conveyor to the right of the man and back of sack fillers. (This illustration is also taken from Oliver Evans' book published in 1795.)

A modern chain flight conveyor operating in a garbage disposal plant. This equipment is of better mechanical design than the one shown in figure 3, but the principle is the same.



Digitized by Google



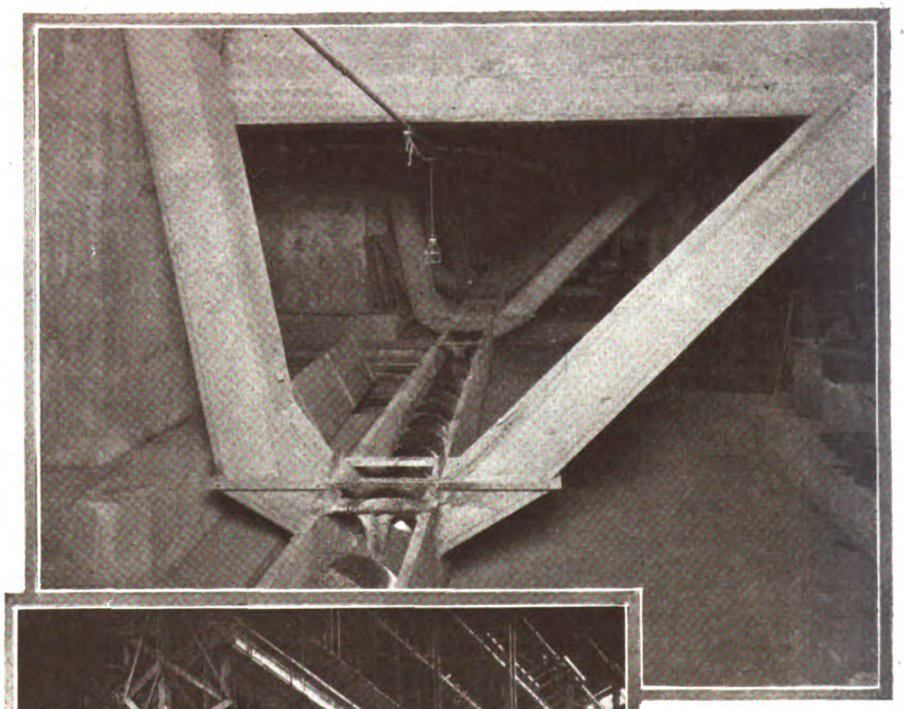
Elevators, screw conveyors, beam scales, and revolving screens, as applied in the year 1795. Grain and meal were the first materials successfully handled by mechanical equipment. Today, all terminal grain elevators, feed mills and flour mills are equipped with the most modern materials handling equipment.. This old wood-cut is of historical interest.

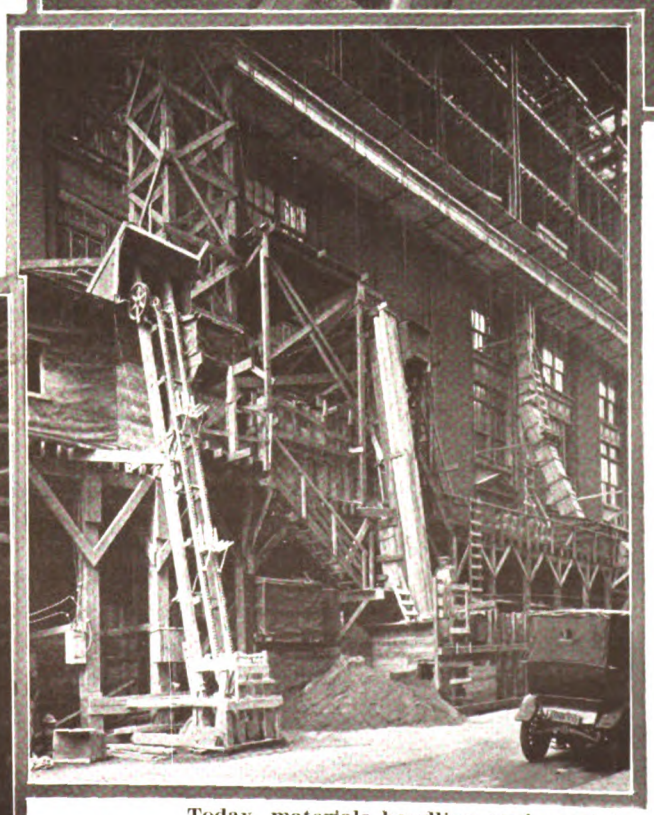
product. In all the trade papers, technical journals, and even in the public press, there is talk of a labor shortage, especially of common laborers and the class of men that are now used for handling the materials between successive operations and in process. It is advocated by many to relieve this dirth of manual laborers by changing the present 3% immigration law. It must be evident, however, that this would only be a temporary relief and one that would not help to eliminate the objectional features now connected with materials handling. These are: large labor forces, which help to increase labor troubles and labor turn-over; heavy lifting, which often results in injury to the laboring man; heavy hauling and energy-destroying work which entails a hazard because it brings on fatigue, often resulting in serious accidents.

It is strange that plant executives still have to be told of the many advantages that can be obtained by using mechanical equipment. They should instead be continually pressing the manufacturers of this equipment for new developments and detailed data regarding the operation of the present standard machines.

Looking at the accompanying illustrations, the reader will receive a fair idea of the diverse operatons that can be performed by one form or other of materials handling

The modern methods are not so very different. At the right is a screw conveyor in a large milling company.. Various kinds of wheat are fed through these chutes, into the conveyors, where they are thoroughly blended and then carried to the mills. Thus the equipment performs two operations.





Today, materials handling equipment is not limited to the handling of grain, nor is it limited to any one industry. One of these elevators carries bags of cement to the mixer and the other elevates sand. In this way the heavy work is taken care of on the modern construction job.

The foot end of a wood apron conveyor which carries material from storage room to machine shop in an industrial plant. The conveyor is reversible, for carrying materials from shop to storage, thus serving as a carrier in both directions.



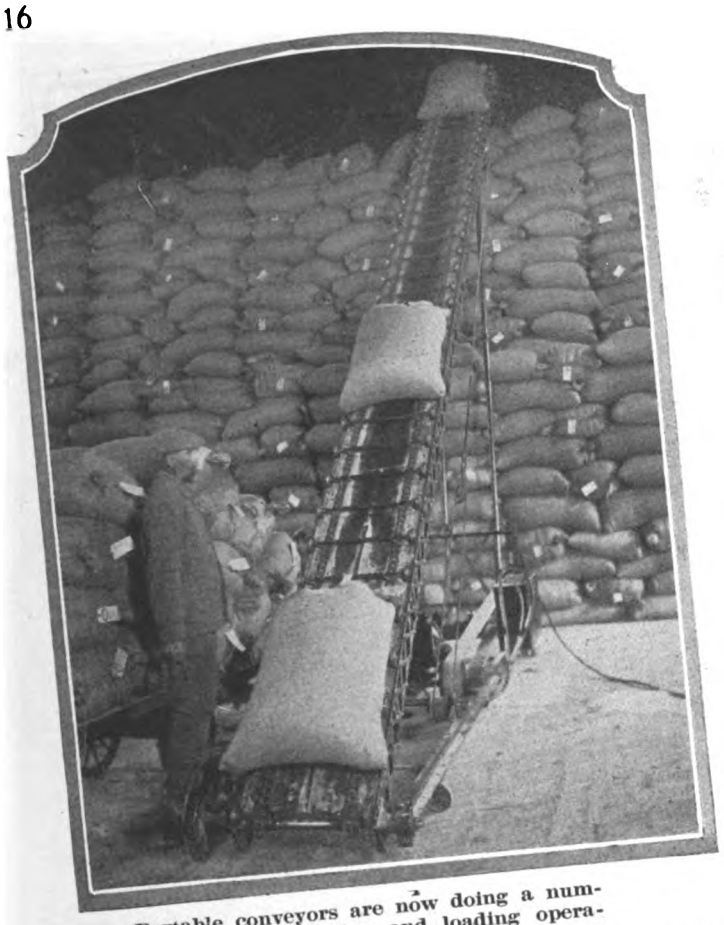
Digitized by Google

machinery. It is possible, with the various pieces of apparatus shown, to handle anything from a small grain of sand or wheat up to a 25-ton truss, and even heavier loads can be accommodated. The designs run from the simplest form of mechanical equipment, such as a single-strand chain-and-bucket elevator up to a 125-ton, 6-motor crane.

Fifteen years ago, most power house cranes were hand-operated and were little more than a pair of I-beams on wheels and a large chain block. Today, although these cranes are called upon to do very little work after the original installation of the generative equipment, they are of the 3- or 4-motor type, cage operated.

This is the type of crane that is now being used in heavy industrial service. It is known as a 125-ton, 6-motor double trolley crane. Each trolley has a capacity of 62½ tons and there is an additional 5-ton auxiliary. The main hooks have a lift of 40 feet, and the auxiliary has a lift of 80 feet. The installation shown on page 17 is in the TMER&L Co.—Lakeside Power Station. This might be called the one extreme of materials handling equipment.

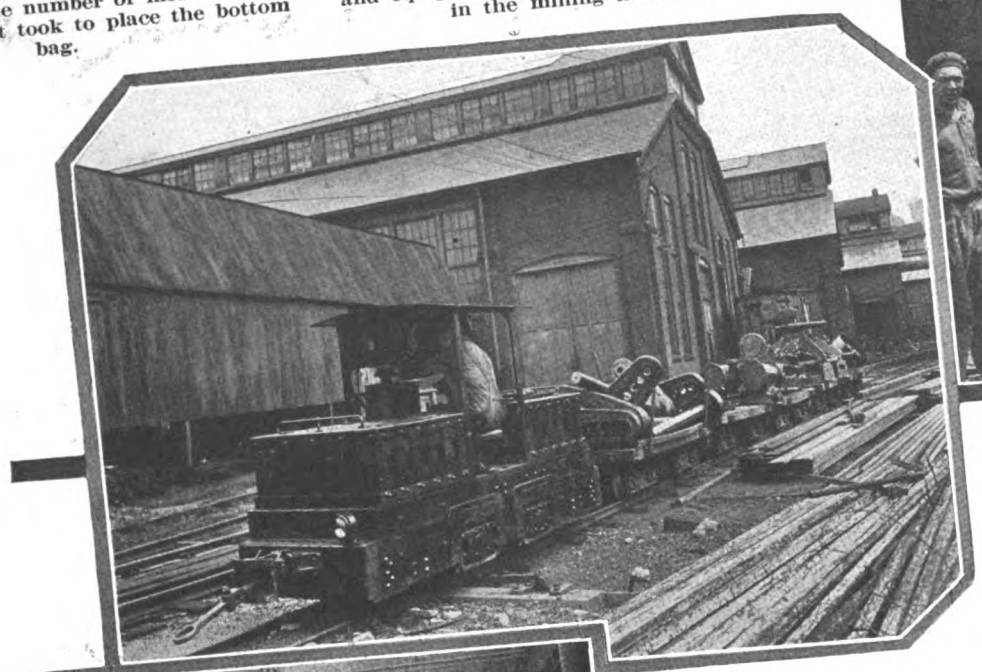
In passing from this to the



Portable conveyors are now doing a number of difficult piling and loading operations. This conveyor, piling sugar, is a great saver of money, time and space. It requires the same number of men to place the top bag as it took to place the bottom bag.



Electric locomotives move materials about the yards in many large industrial plants, and equipment of this class has a big field in the mining industry.



American genius has added elevator principle. This wagon material and automatically dis operator simply moves the lev to shift its



Lift-platforms with hand and electric storage battery lift-trucks are reducing the cost of handling. The loading and unloading of materials from hand trucks is an unnecessary expense.

It might be said that "materials handling equipment serves us while we are alive and after we're dead." This overhead monorail is handling tombstones.



Digitized by Google

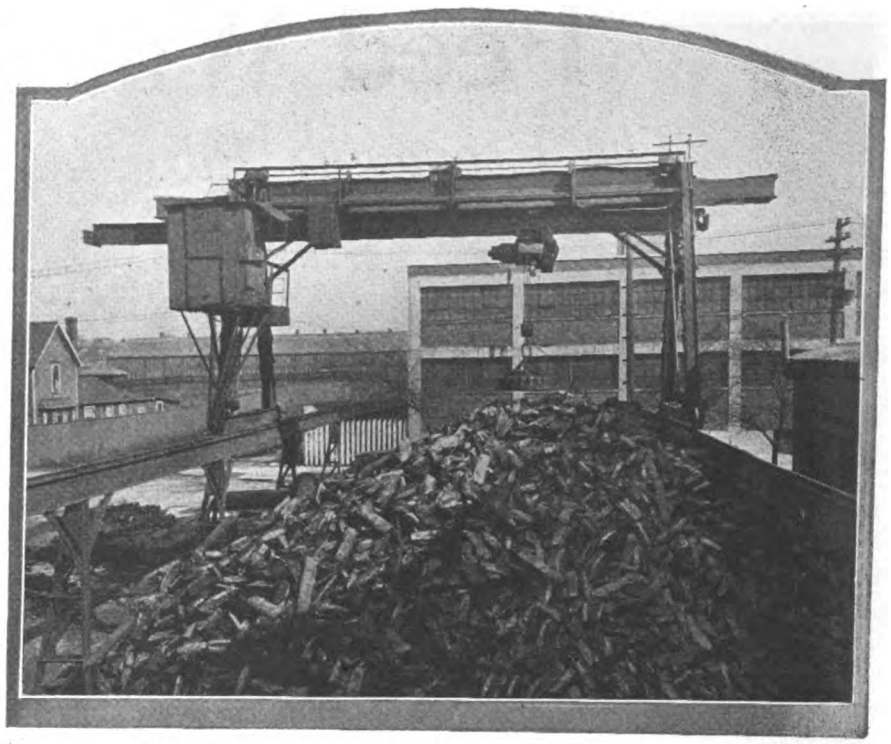
opposite extreme, we will turn to the second illustration on page 14. This mechanical equipment is doing an entirely different service, but without a doubt the installation of this simple elevator permitted the operator of this concrete block company to run his plant with at least 2 men less than would have been required had he decided to elevate his materials by hand.

The writer was very much interested in the wood cut, reproduced at the foot of page 17, because it shows so many pieces of materials handling equipment. The elevator to the left is operated by means of horse or team attached to a whiffle-tree and beam (see mark A). It is assumed that the other elevator, conveyor and mill stones are operated by power derived from a water wheel. The conveyor on the floor of the mill embodies the same principle as the modern flight conveyor shown at the right.

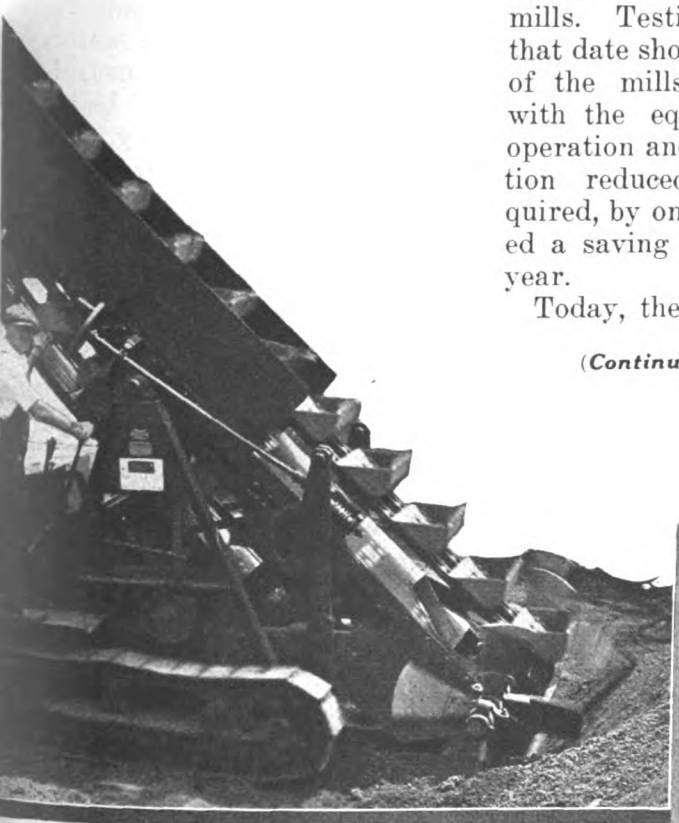
The cut at the top of page 15 shows the complicated layouts of material handling equipment that were successfully installed as far back as the years 1794 and 1795 in flour and feed mills. Testimonial letters of that date show that the owners of the mills where satisfied with the equipment and its operation and that its installation reduced the labor required, by one-half, and effected a saving of over $300 per year.

Today, the use of this class

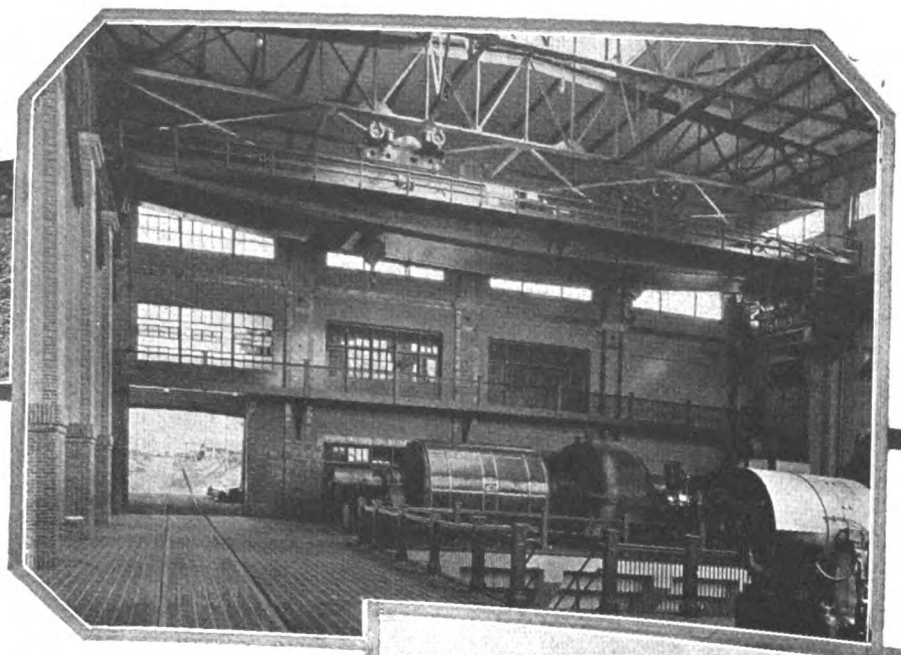
(*Continued on page 54*)



Cranes and electric magnets are now doing the difficult work of handling pig iron and sheet metal scrap. This is only one of the many problems that this equipment can solve. Large sheets, and pipe, can be handled in the same manner.



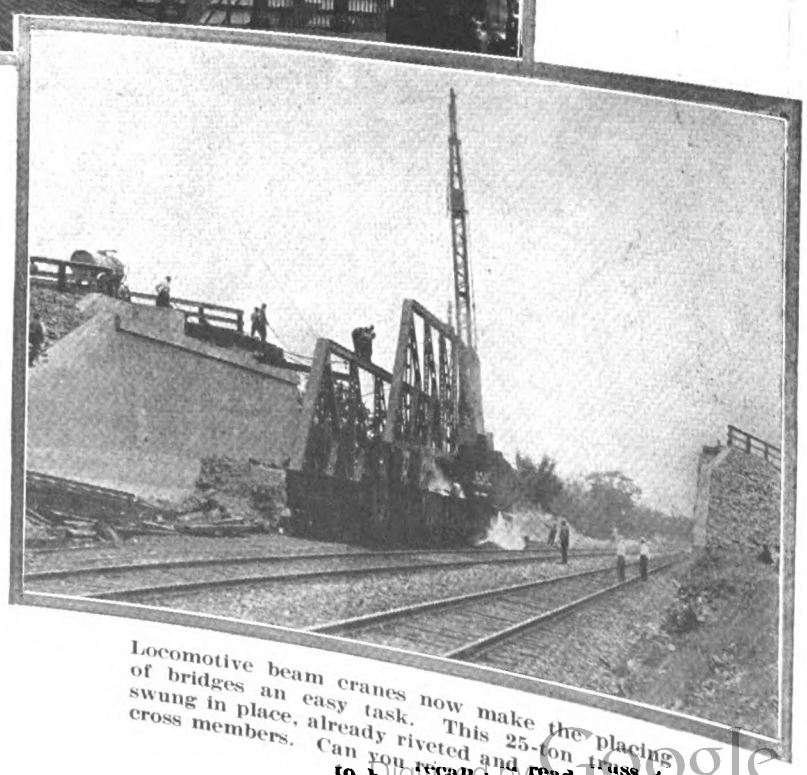
Where large machines have to be placed, an overhead crane is a great time saver. Fifteen years ago most power house cranes were hand-operated and comprised little more than a pair of I-beams on wheels and a large chain block.



many attachments to the old oader feeds itself, elevates the harges its load; the one man rs when he wishes the machine osition.

This phase of materials handling is the most modern, and one that will show considerable development within the next few years; namely, sectional demountable freight cars and truck bodies as a national transportation medium.





Locomotive beam cranes now make the placing of bridges an easy task. This 25-ton truss is swung in place, already riveted and ready for the cross members. Can you recall how bridges used to be built?

Digitized by Google

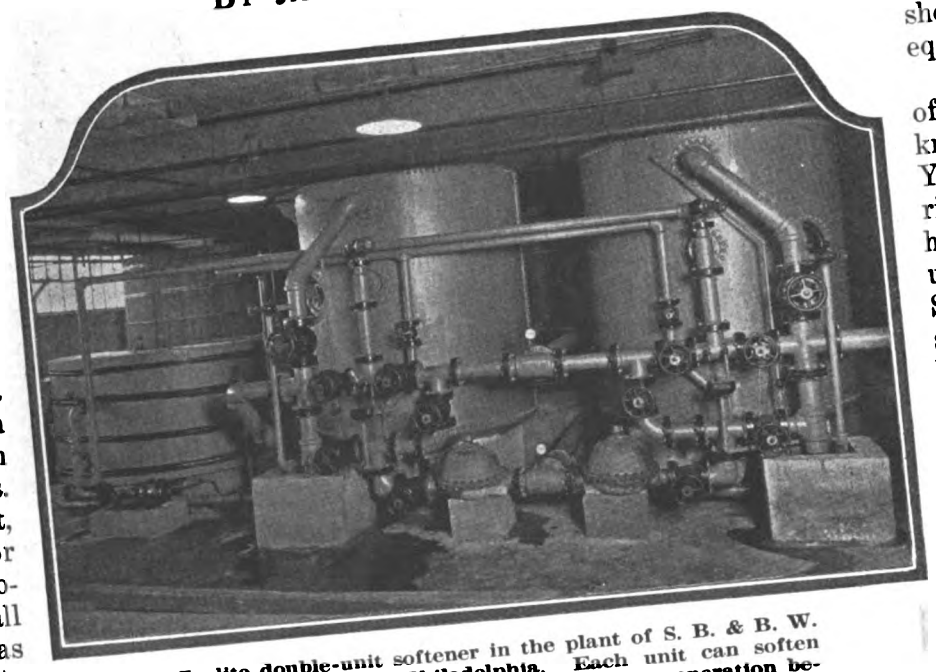
Feed Water Treatment

The Economies Possible Through Proper Equipment

By James T. Beard, 2nd

IF your superintendent were to come into your office this afternoon and make the startling announcement that no attempt was being made to check the quality of the raw materials that go into the manufacture of your product, the chances are that he would be immediately subjected to a rigid cross examination in an effort to determine the reason for such a state of affairs. But, if he were to tell you that, although the use of inferior materials was increasing production costs due to waste all along the line, no attempt was being made to raise the quality to the recognized and approved standard, you would probably have a hard time to keep your feet on the floor.

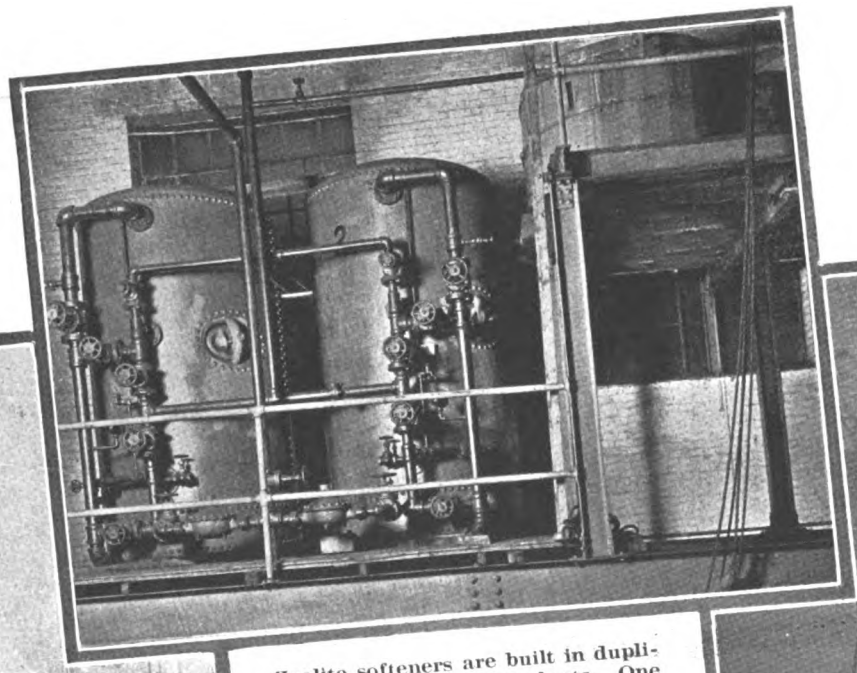
Unless your plant is one of the exceptions to the rule, however, it is quite likely that the lack of definite knowledge of your feed water problem is costing thousands of dollars in terms of increased coal costs, high labor and maintenance costs, uncertain operation, interrupted production and shortened life of your boiler equipment in the power house.



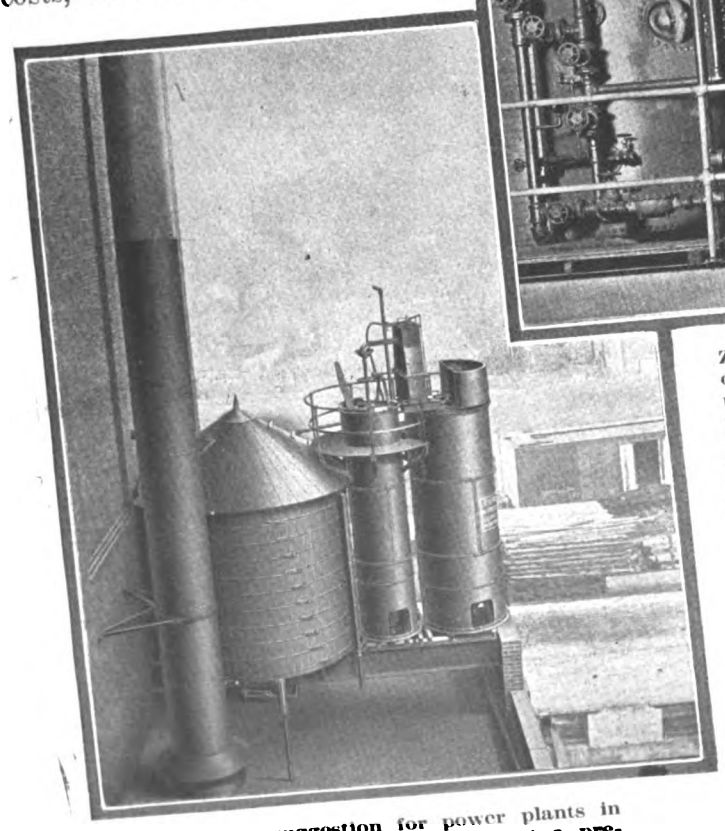
Zeolite double-unit softener in the plant of S. B. & B. W. Fleisher Company, Philadelphia. Each unit can soften 140,000 gallons of 7.3 grain water before regeneration becomes necessary.

I have a picture in my mind of the power plant of a well known manufacturer in New York state. The load is carried on two boilers, of 600 total horsepower, operating continuously for 24 hours a day. Six years ago boiler scale resulting from poor feed water, kept this plant under considerable expense. Each boiler had to be cleaned every four weeks. Thirty tubes were renewed each year. Scale averaged from 1/3 to 1/16 inches in thickness and was responsible for large fuel losses.

I have another picture in my mind of the same plant today. In the meantime they had made a careful study of their feed water problem and installed a suitable water softening plant. The formation of scale, sludge and mud has been completely stopped. The boilers steam better. Tube replacements have been eliminated. An actual fuel saving of two tons of coal a day has



Zeolite softeners are built in duplicate units for 24-hour plants. One unit is delivering softened water, while the other is "regenerating." This particular outfit is saving money for Supplee-Wills Jones Company, Philadelphia. It has a capacity of 40,000 gallons between "regenerations."

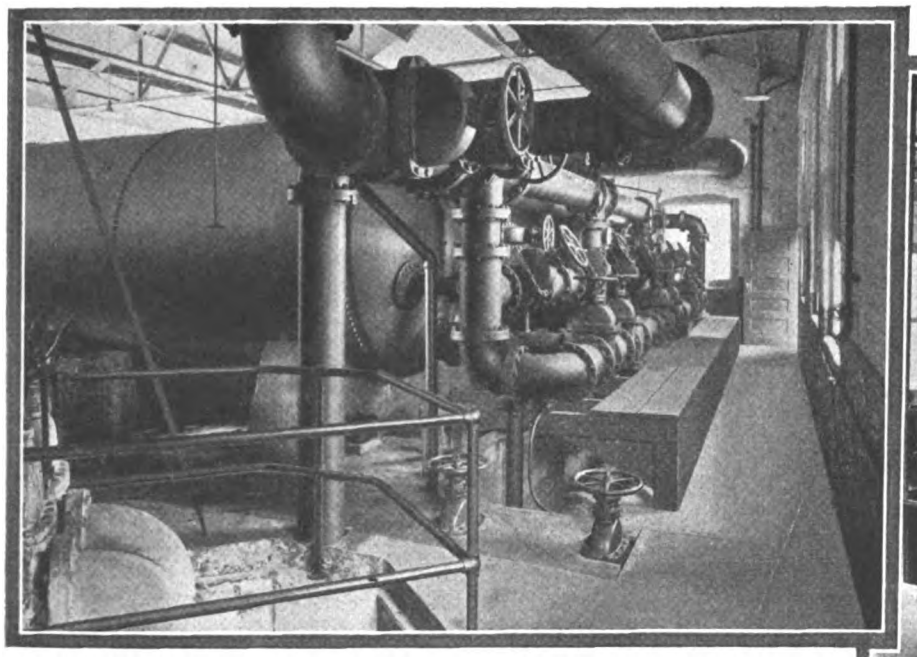


Here is a suggestion for power plants in congested cities where space is at a premium. If proper provision is made in the steelwork and supporting members of the building the bulky tanks may be placed on the roof.

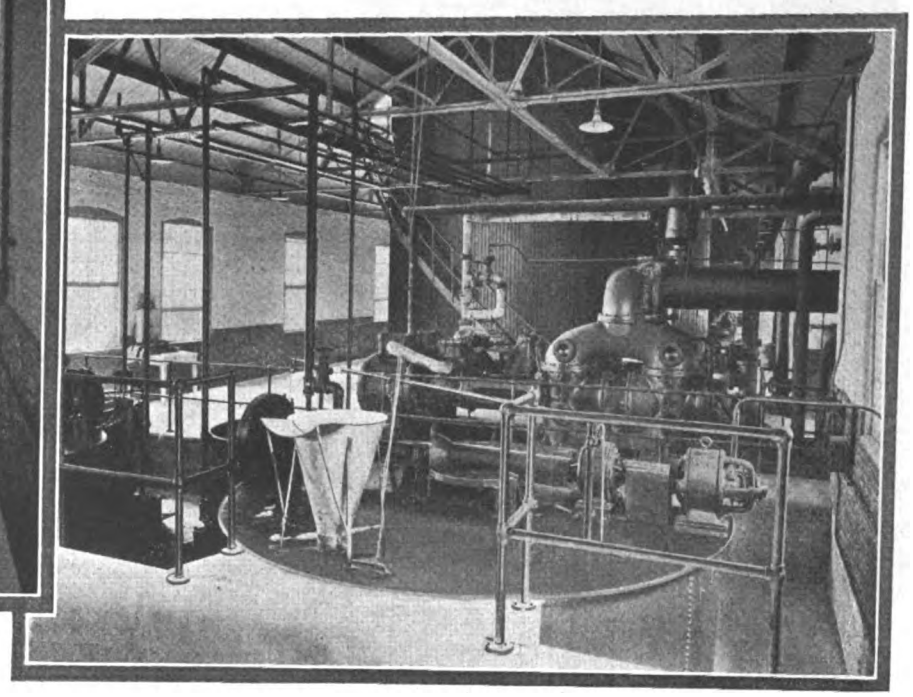


The hot process of lime-soda feed water treatment has many advocates. In this installation at the Wisconsin Steel Company, South Chicago, the water is first passed through an adequate heater, located above the settling tank. The smaller tank in the [illegible] hand corner is the hard water apparatus tank.

Digitized by Google



Six filters are necessary to take out the sediment and precipitated salts that will not settle of their own accord. The picture shows the filter room which is a part of the **water purification equipment at the Wisconsin Steel Company's plant.**

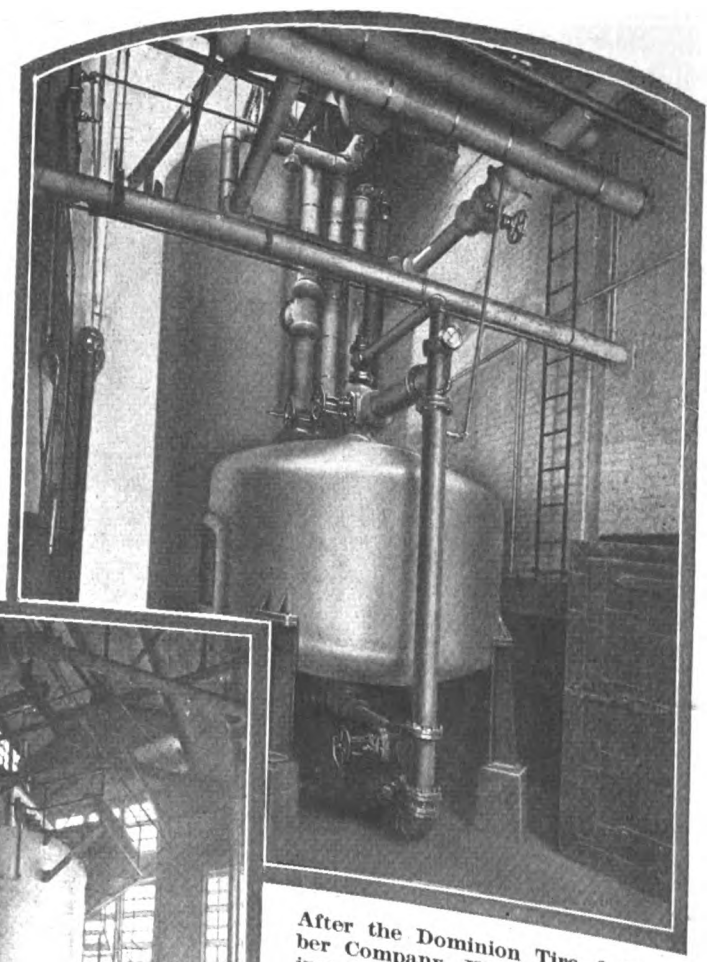


General view of the hot-process lime-soda water softening equipment at the plant of the Wisconsin Steel Company. The chemical and chemical control tanks are seen in the foreground, while the large settling tank is behind them.

been the direct result of this change.

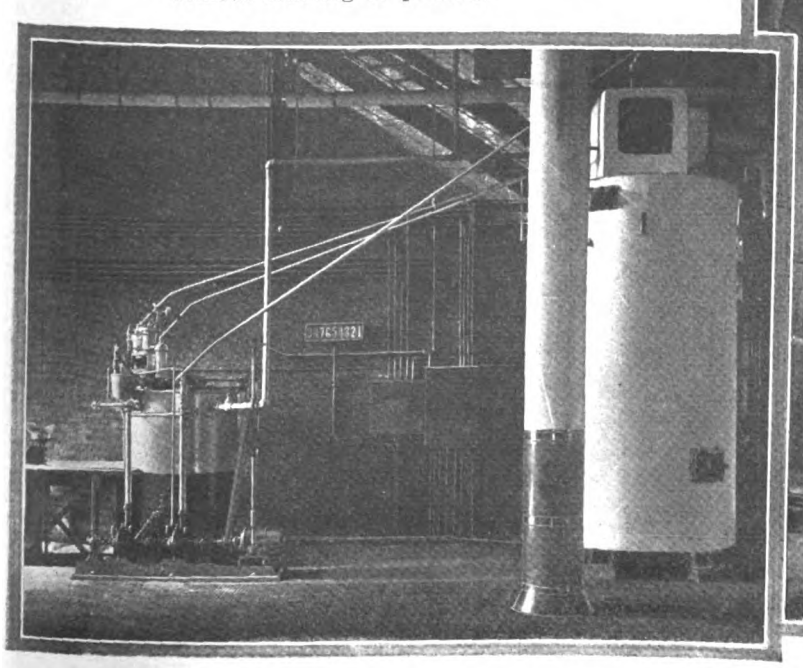
The feed water in this plant was not what would ordinarily be called bad. Feed water does not have to be bad to cause boiler troubles. Constant evaporation of the water leaves all dissolved impurities in the boiler, until the water becomes so concentrated with salts and sediment, that the heat bakes them into a thin crust on the metal surfaces of the tubes and drums. This heat-resisting layer grows thicker and, as it grows, more coal is required to evaporate the same amount of water than before. When the scale becomes sufficiently thick the heat of the furnace is apt to blister the tubes. At times the metal becomes very hot, and softens and bulges under the pressure in the boiler. In bad cases the metal will fail completely and the tube will burst.

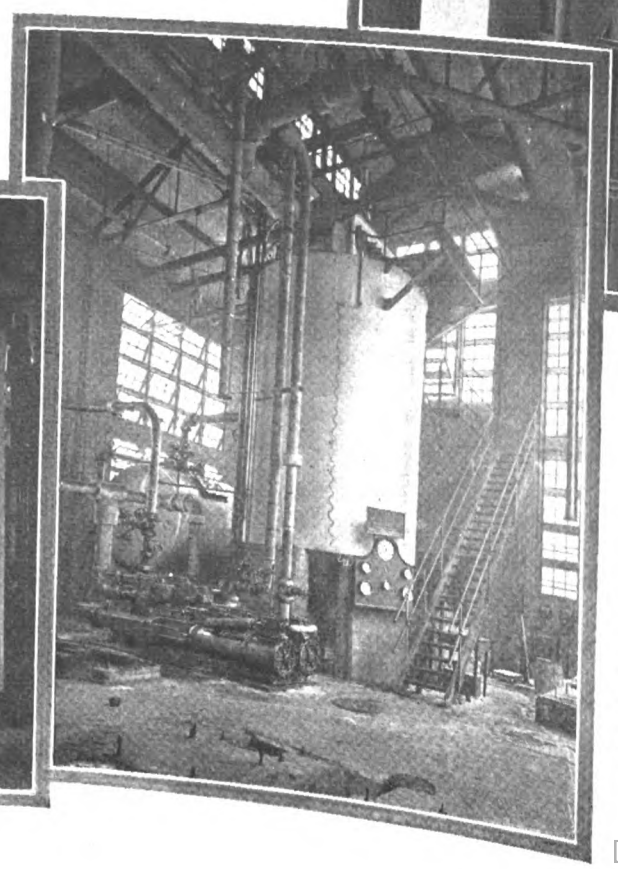
To prevent loss of operating efficiency and to insure the safe operation of the boiler, it is necessary to knock out this scale by mechanical devices, as fast as it accumulates in any appreciable thickness. How fast it will accumulate depends upon how much impurity is in the water. Every time a boiler has to come off the line for cleaning it costs real money, for the heat in the boiler and setting is entirely



After the Dominion Tire & Rubber Company, Kitchener, Ontario, installed this equipment the boiler inspector reported that their previous trouble with scale and corrosion had been eliminated. This particular installation has a capacity of 10,000 gallons per hour.

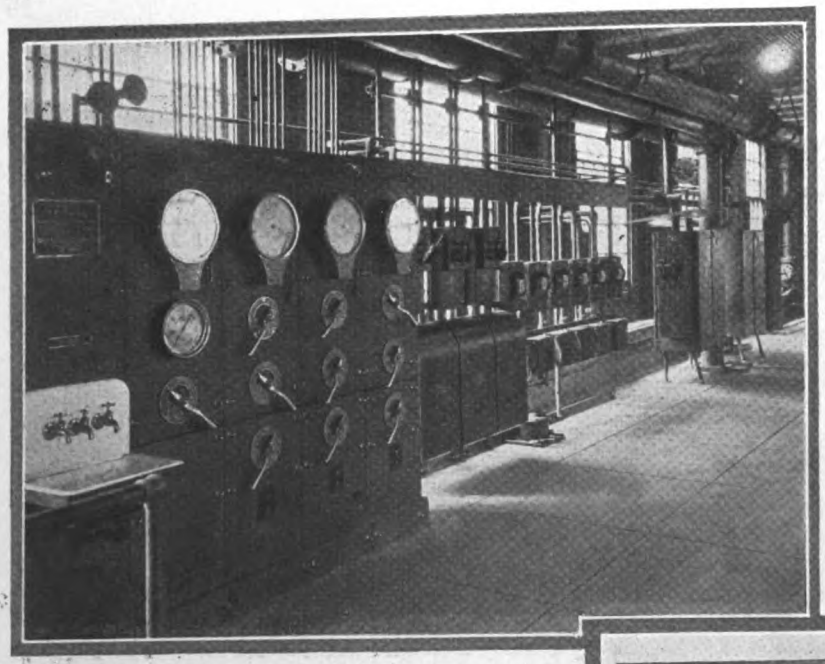
It was considered part of the boiler room routine at the Louisville Street Railway Company's plant to turbine the tubes every six weeks. Then came the water softener and the boilers are now operated for more than a year without cleaning. They operate at 160 to 200 per cent. of rating on Ohio River Water without foaming or priming.



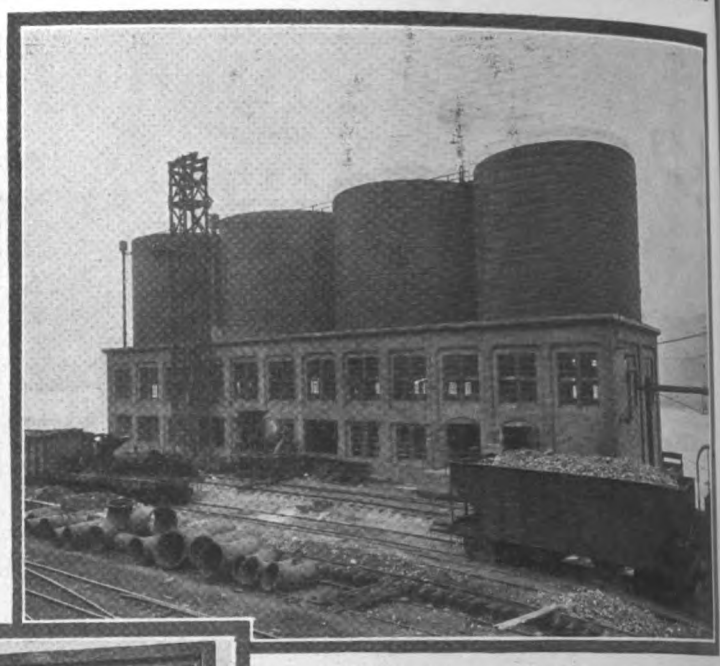


Three tube replacements per month as compared with thirty before this softener was installed in the plant of the Halcomb Steel Company, Syracuse, tells a worthwhile story of reduction of maintenance costs. 12,000 gallons of 40 grain water are handled every hour by this softener.

Digitized by Google



Feed water purification control reduced to a science. The picture shows sampling and operating board of a feed water purification system which controls positively every detail of the system. Recording gages give full record of the operating cycle of each tank.



Central water purification plant from which several boiler houses are served. The capacity of this installation is 3,000,000 gallons every 24 hours.



Without any previous knowledge of chemistry any chief engineer can manipulate one of these testing cabinets and find out what kind of boiler feed water he has to deal with. It takes the guesswork and experiment out of his feed water treatment and often puts the boiler house on a dividend-paying basis.

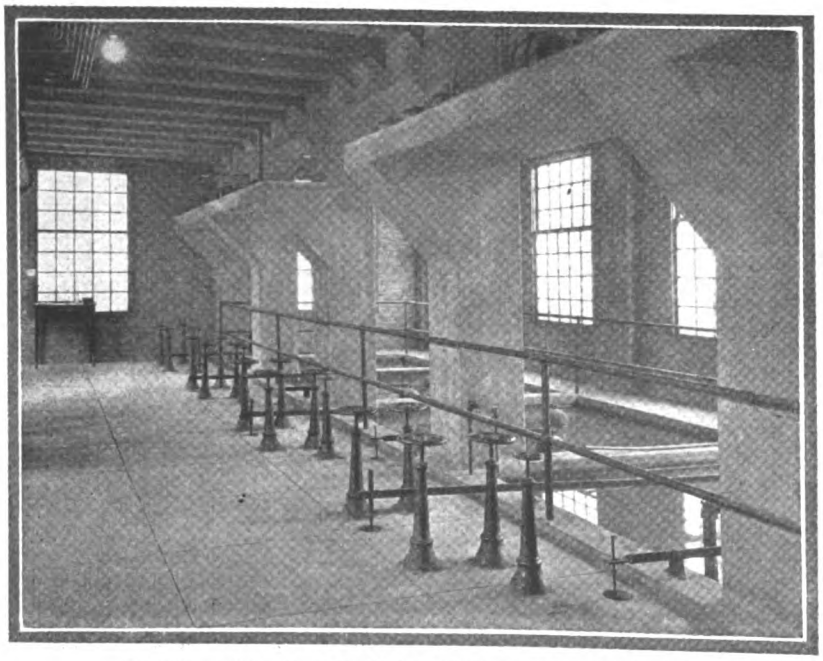
lost, the labor involved is a big item and the weakening of the boiler structure due to the strains of cooling and reheating lessens the life of the equipment.

I have a picture of another plant where the "chief" prides himself on his excellent feed water. Each boiler is cleaned every three months. Boilers are blown down twice daily. And the plant averages two tube renewals a year for each boiler. Water softening is considered unnecessary. The "chief" is right,—the water is undoubtedly good.

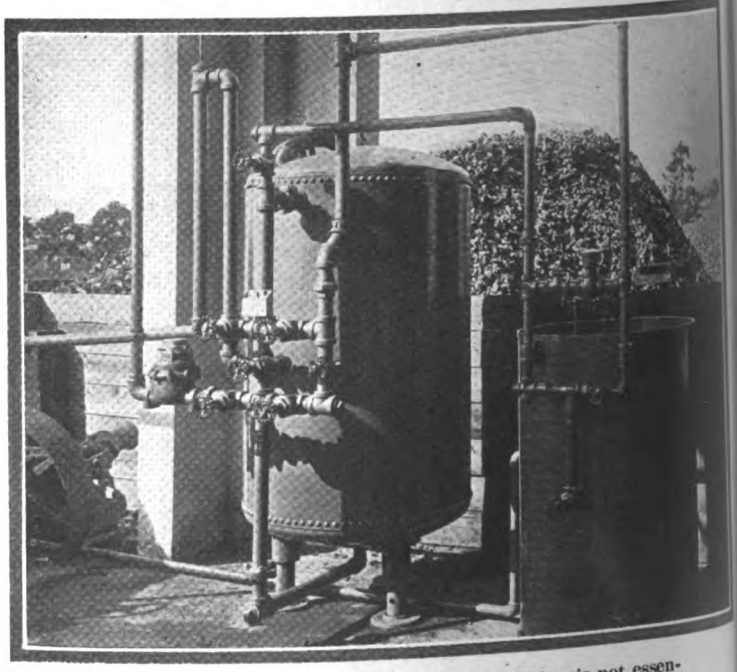
Across the river is another plant, using practically the same water, but treating it in a well designed softening system. In this second plant there has not been a tube renewal nor a boiler cleaned in the past two years.

"Good" water or "bad" water really do not mean anything from a boiler room operating standpoint, unless you can also tell "how good" or "how bad." I once had occasion to ask a certain chief operating engineer why he thought his water was good. He replied that he never had any boiler trouble. Further questioning elicited the information that he cleaned the boilers three times a year and possibly renewed one or two tubes during the same period in each unit. I wonder what he would say about his feed

(Continued on page 28)



Interior view at the filter house of the 3,000,000-gallon plant. Overhead motors opera[illegible]nical stirring devices. Each filter is co[illegible]n-dividual control valves. Pipe con[illegible] equipment and clear water well [illegible] level.



Where continuous 24-hour operation is not essential, it is possible to purify feed water with a single zeolite unit as shown here, since there is ample time for regeneration during the no-load or light-load material.

Digitized by Google

Promoting Team Work Through Athletics

How Studebaker Has Reduced Labor Turnover and Increased Production, by Fostering Sports

By D. G. Baird

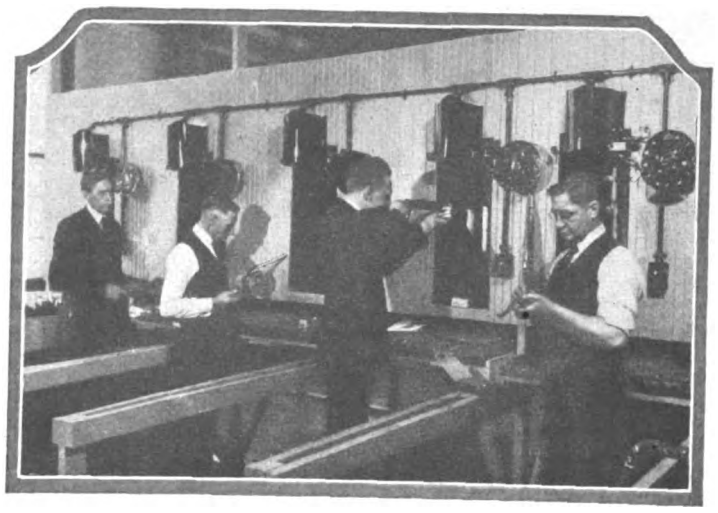
IN the month of May, 1920, an average payroll of 5,601 produced 3,530 automobiles in the Detroit plants of the Studebaker Corporation. In the same month of the following year, an average payroll of 4,650 produced 4,059 automobiles in the same plants. During the corresponding month of 1922, an average payroll of 4,996 turned out a total of 5,722 Studebaker cars.

Comparison of other corresponding months of these years shows similar results. June of 1920, for example, reveals an average payroll of 5,790 and a production of 4,183 cars. During the corresponding month of the following year, an average payroll of 4,695 produced 4,522 cars, and in June, 1922, an average payroll of 5,112 turned out 5,461 automobiles.

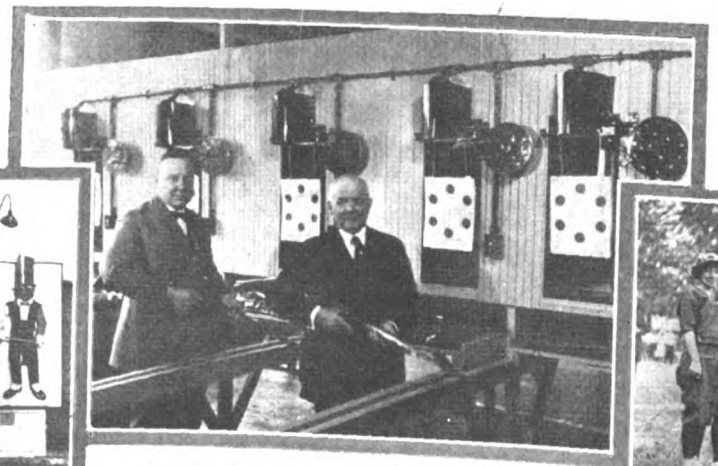
These months are chosen for comparative purposes because it is at this time that automobile production is at the maximum and it is to be expected that labor turnover would, therefore, be at the maximum also.

Now consider this matter of labor turnover during the same months of the same years. In May of 1920, the labor turnover in the Stude-

(Continued on page 46)



Target shooting is not only an interesting pastime but it trains the eye. At the Studebaker No. 5 plant there is both a 75-foot and a 25-foot range.



In the above picture Mr. Max Wollering, vice president of the company, and Mr. C. L. Bockus, in charge of production are initiating a new range.

This very attractive display was used to advertise the big yearly event given to replenish the employees' charity fund.





"Three strikes and out" is the title of this picture.



The ladies have their part in Studebaker athletic activities. Here is the winning team of plant No. 5, with its manager and mascot.



An exciting moment during the Tug-of-War in which plant No. 3 won the event and the silver cup.

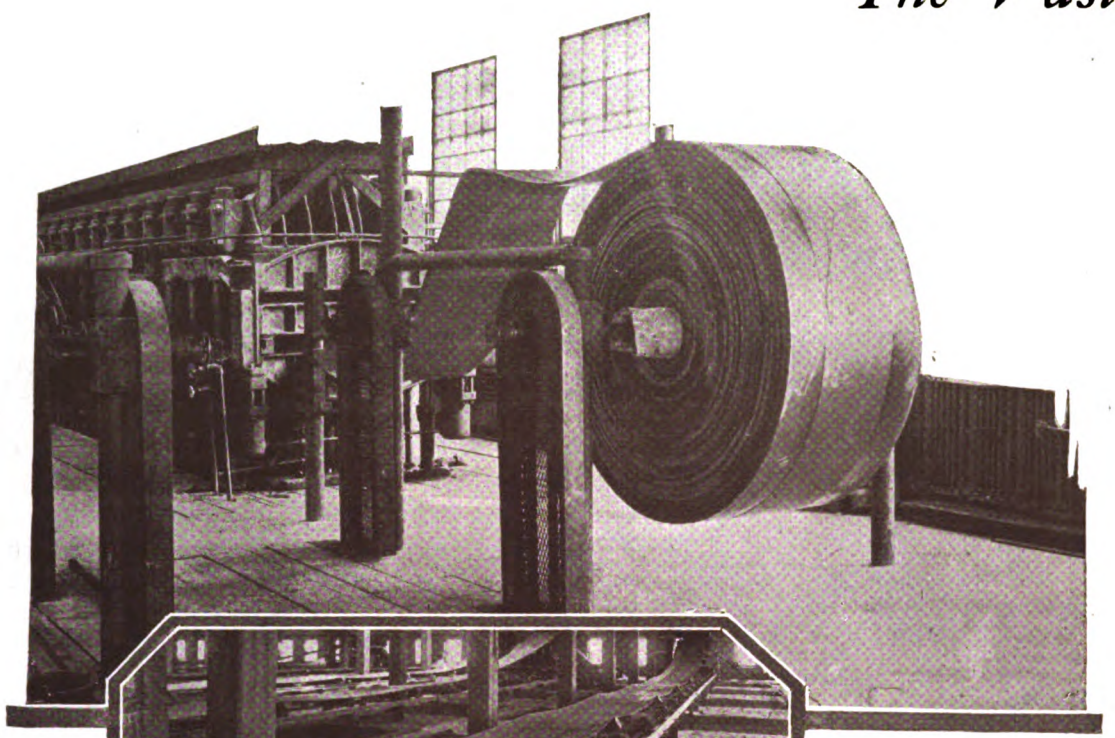
Here is an interesting chart that shows a rather unusual employment record and how the turnover has been reduced by making life interesting for the workers

Digitized by Google

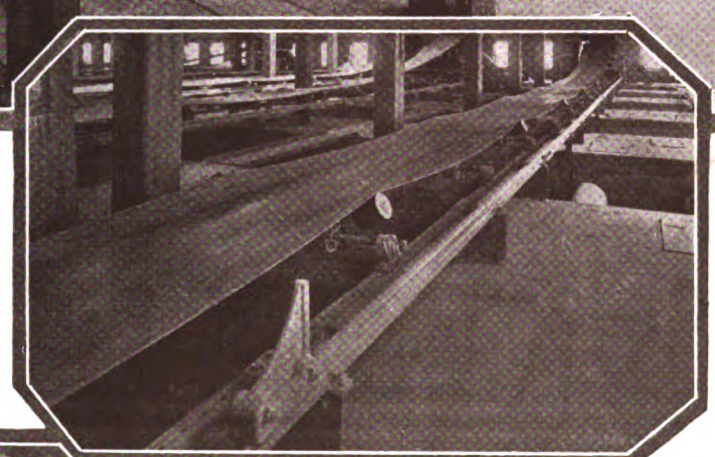
The Future of

The Vast Progress of the Last

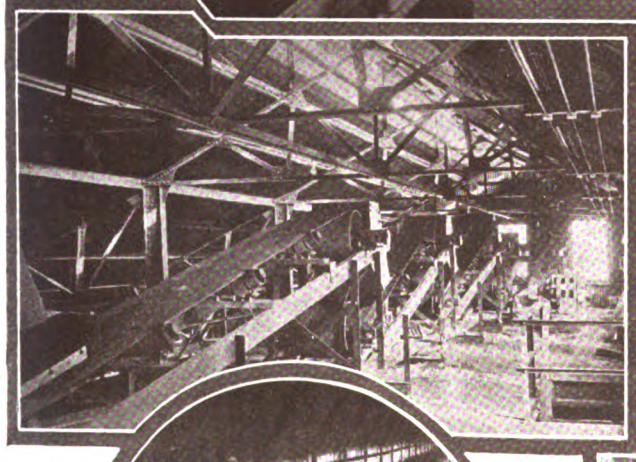
BY FREDER



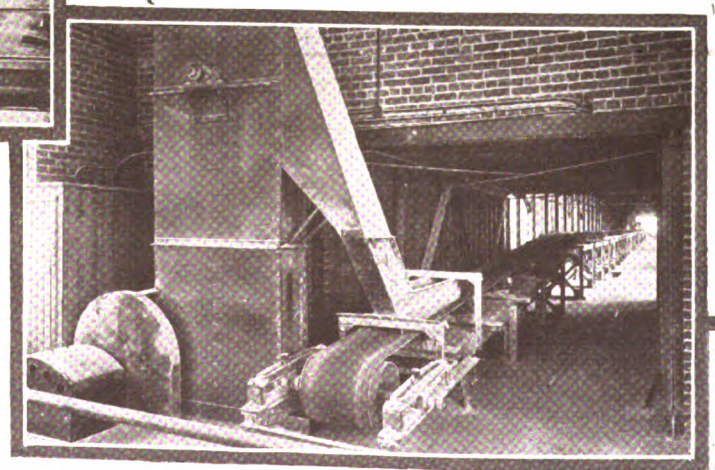
A rubber belt with an extra heavy cover ready for vulcanizing. Rubber covers protect the body of the belt from cutting and abrasion.



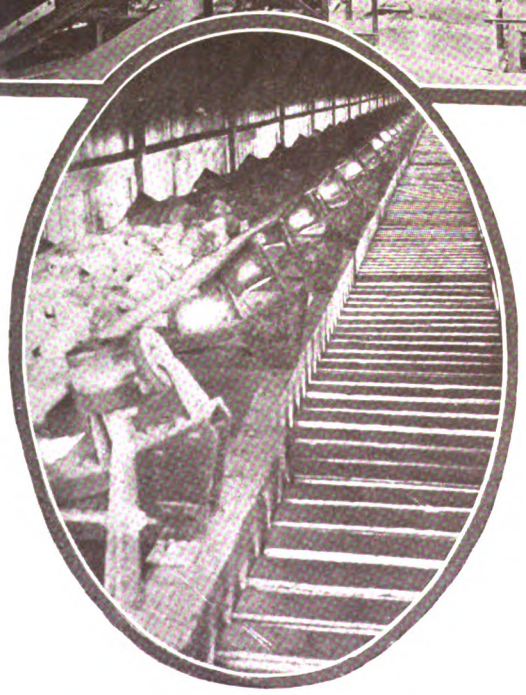
In a large grain elevator there may be from four to eight miles of belt. In this installation all the supporting and concentrating idlers run on roller bearings.



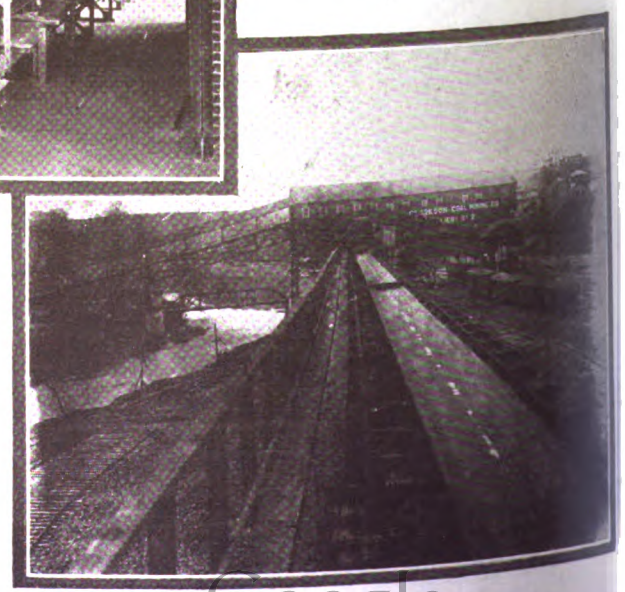
A canvas belt running through a series of fixed trippers and carrying crushed ore. A severe service on account of many reverse bends and the repeated reloading of material back on the belt at the transfer points.



The right way to load a belt conveyor: the chute delivers material to the belt with some velocity in the direction of travel.



A heavy stone conveyor with belt supported on sheet-steel pulleys fitted with ball bearings.



A modern tripper which carries side-delivery belts to distribute material along each side of the conveyor and thus increase the amount of material stored by the main belt.

When we speak of the future of belt conveying, there are several phases of the subject to be considered.

1. It is probable that new uses will be found for belt conveyors, new either as to materials handled, or as new combinations of machines to collect, convey or distribute materials in better ways.

2. With the increasing demand for labor-saving machinery and the concentration of production in large establishments, there will come not only a greater need for belt conveyors, but for belt conveyors of greater carrying capacity and greater length.

3. Knowing what has been done in the past in the improvement of the means for handling materials, we may, in imagination, project forward the line of improvement and think what the ingenuity of men may develop in better belts, and better accessories for supporting, loading and discharging the belts.

These three phases are closely related: ever since the first use of belt conveyors, improvements in conveyor design have gone hand-in-hand with the greater use of conveying machinery, and as new uses and heavier duties were imposed on belts, belt makers have responded to the demand with better, stronger and longer-lived belts.

In the first belt conveyors

Digitized by Google

Belt Conveying

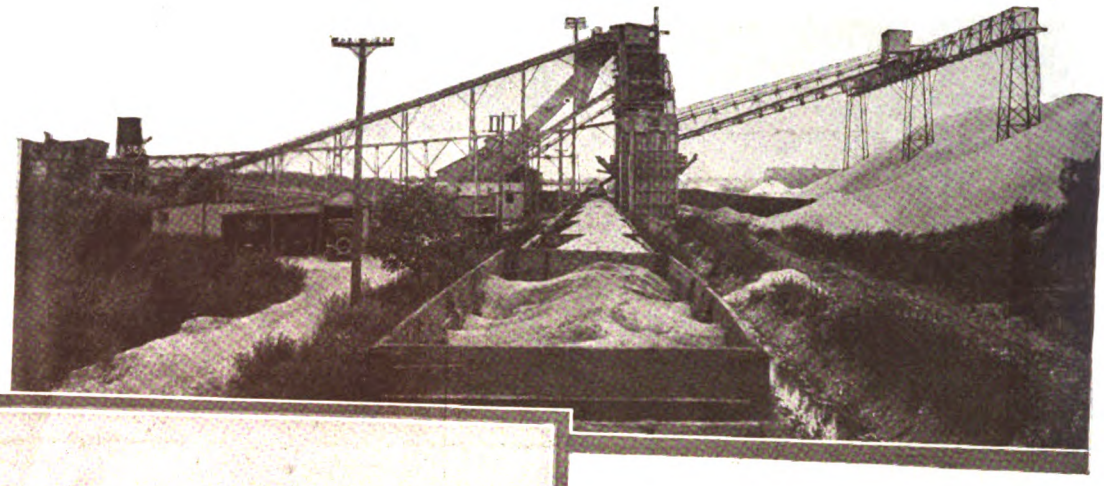
Few Years, and What It Presages

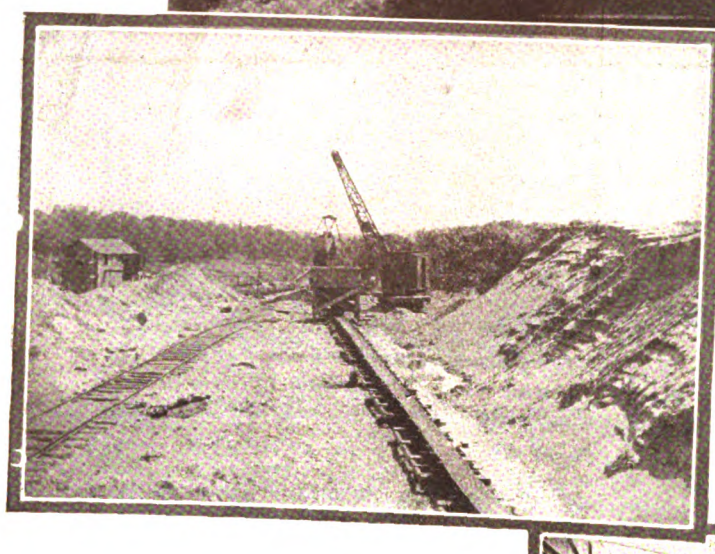
ICK V. HETZEL

used in this country, over a hundred years ago, the belts were a single ply of sail canvas, not waterproofed, or were of leather cut from the tanned hide, but not filled and stretched as leather belts should be. These old line belts ran crooked, they changed their length according to the weather, and were generally so troublesome that they did not come into extensive use. There were mills and factories here and in England where belt conveyors could have been used, but screw conveyors were preferred, even though they took more power to run.

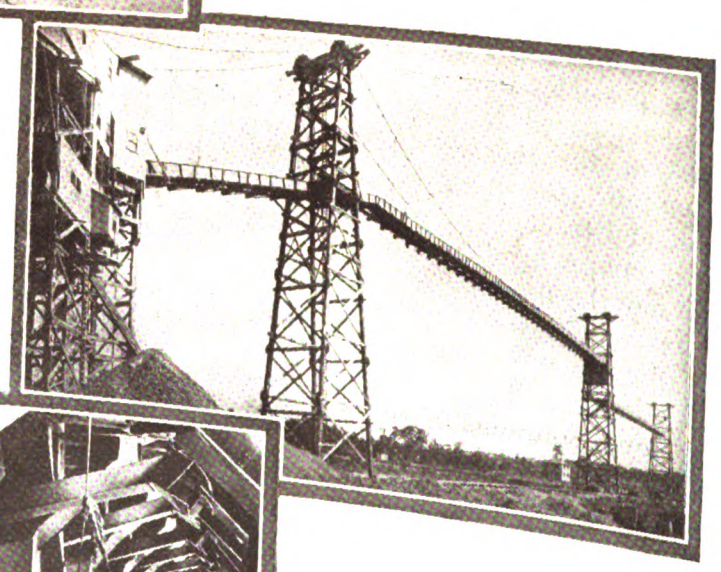
The first rubber belts for conveyors were made for experiment in England about 1860, after 1870 they came into practical use in this country. About the same time, impregnated and pre-stretched canvas belts were introduced. These various improved belts were used at first to carry grain and flour-mill products.

Rubber belts with thickened rubber covers came into use after 1893. As they could carry rough, heavy and abrasive materials without serious injury, they immediately extended the use of belt conveyors to such materials as coal, ores and minerals which prior to that time were not handled well in conveyors of other types nor carried economically by rubber belts which lacked the reinforcement of the rubber cover. Rubber belts as now

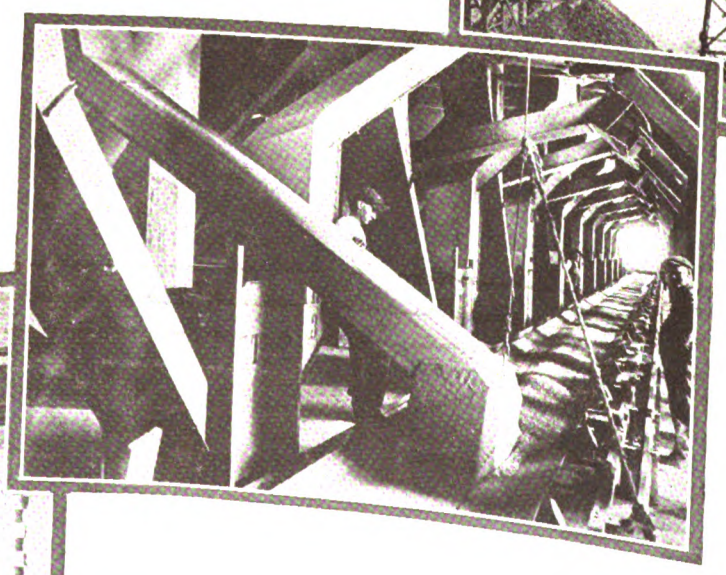




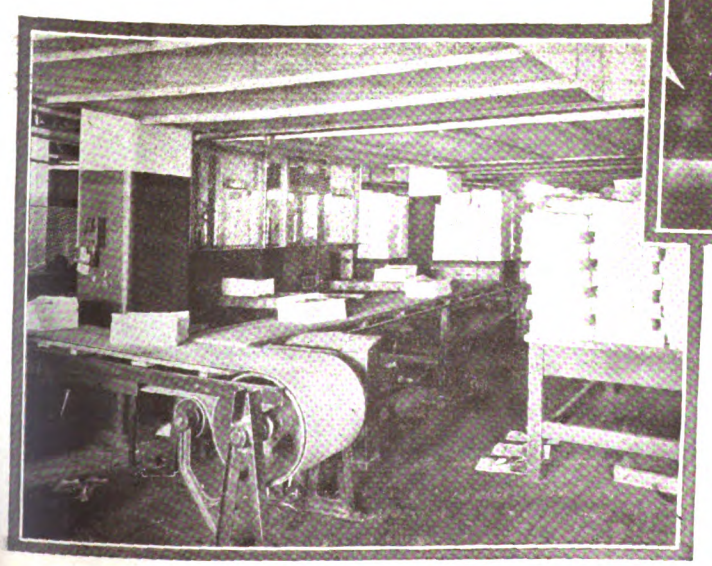
The sand and gravel business could not exist without the belt conveyor. One inclined belt delivers to the washing. The other delivers to a shuttle conveyor on the elevated trestle, and this by moving to and fro forms a pile the crest of which is twice as long as the shuttle.



A belt conveyor carried on portable frames brings the excavated material to a central car-loading station. Shifting the conveyor is more convenient than shifting the siding.

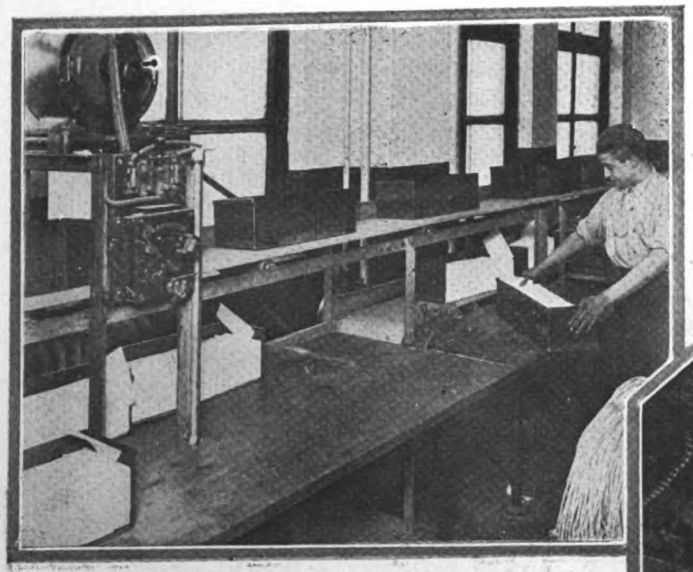


In this grain elevator there are 25,000 shaft bearings fitted with anti-friction rollers. After 4½ years of service, the bearings in this conveyor show practically no wear although they have made over 300,000,000 revolutions.

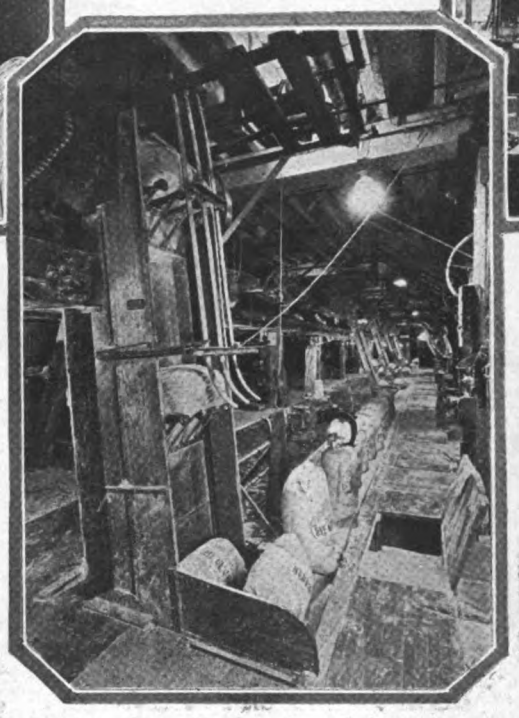


Belt conveyors in a publishing house carry magazines from automatic discharge elevators to wrapping counters. Two right-angle transfers between moving belts without disarranging or upsetting the piles of magazines.

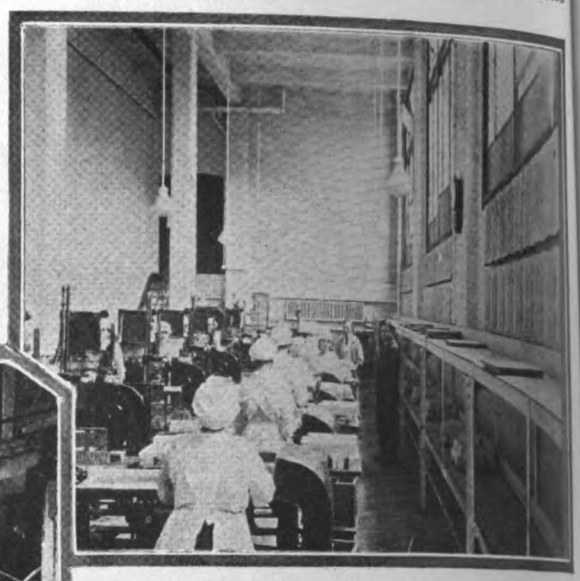
Digitized by Google



A double deck belt conveyor in a book bindery carries loaded containers in one direction on the lower run and returns empty containers in the opposite direction on the upper run.



Sewing shut the mouths of flour bags while in transit on a belt conveyor.



A belt conveyor serves a long line of machines, increases output and reduces costs.

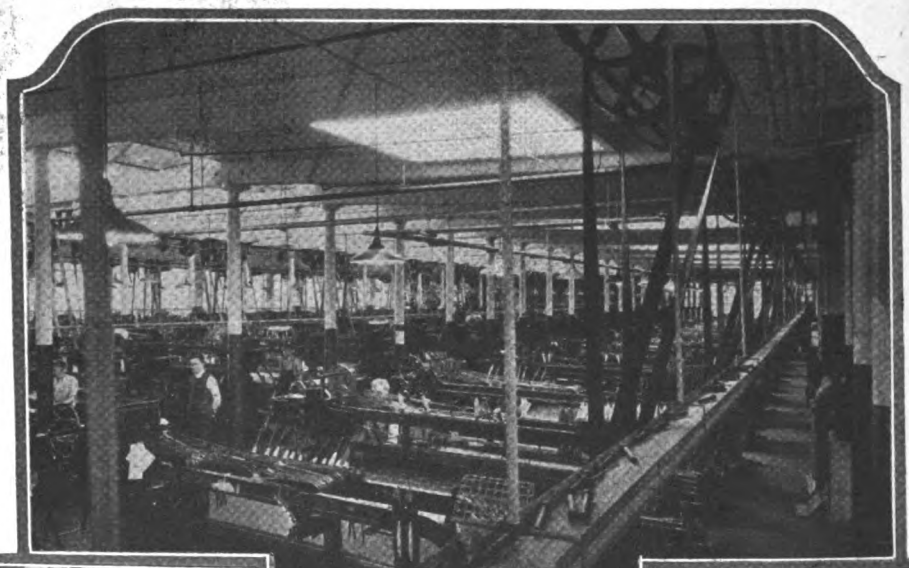
made by experienced manufacturers are the development of the past fifty years, but there is no reason to think that progress has stopped. Conveyor belts are, in general, better than they were, especially in this line of heavy belts for hard work, and we may hope and believe that the rubber belts of the future will be still better. In belts built up of a number of plies of woven cotton duck cemented together by a rubber compound, it is possible that methods will be devised to make the fibres of the threads in the cotton fabric thoroughly waterproof and to hold the plies of fabric more firmly together. This may be done by treating the fabric with the liquid latex or sap from the rubber trees, or by impregnating the duck with liquid solutions of rubber compounds, and then vulcanizing the assembled plies of waterproofed fabric with a finished belt.

Some belts have been made in which the lengthwise structure of the body is made up of many parallel cords, larger and stronger than the threads which compose the warp of the duck in belts as ordinarily made. The work in this direction is, for the present, experimental and introductory, but the possibilities are interesting. Such belts are likely to be stronger than fabric belts, and hence well suited to conveyors of great length and heavy loading. If they can be sold at prices to compete with standard rubber belts, the developments in this direction are not likely to be slow or delayed.

In recent years canvas belts and balata belts have been greatly improved and are coming into extensive use. For strength, resistance or moisture and freedom from stretch, they compare favorably with good rubber belts.

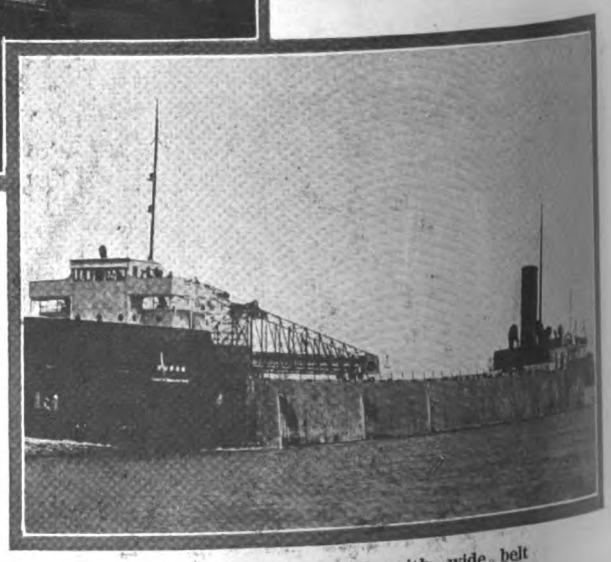
In the means of supporting the belt, there has been improvement, but it has come slowly. The grease-lubricated,

Below—conveyors in a large textile mill.



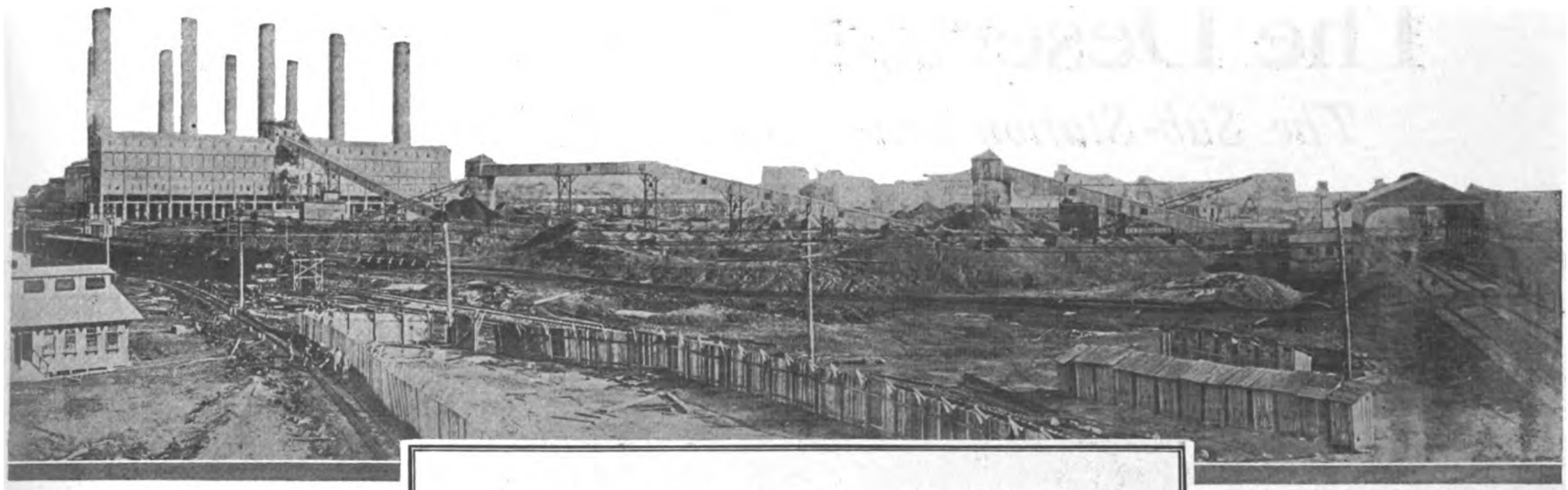


A belt conveyor with oilless bea ries washer goods on one dec wearing or soiling, carries wra on lower deck.



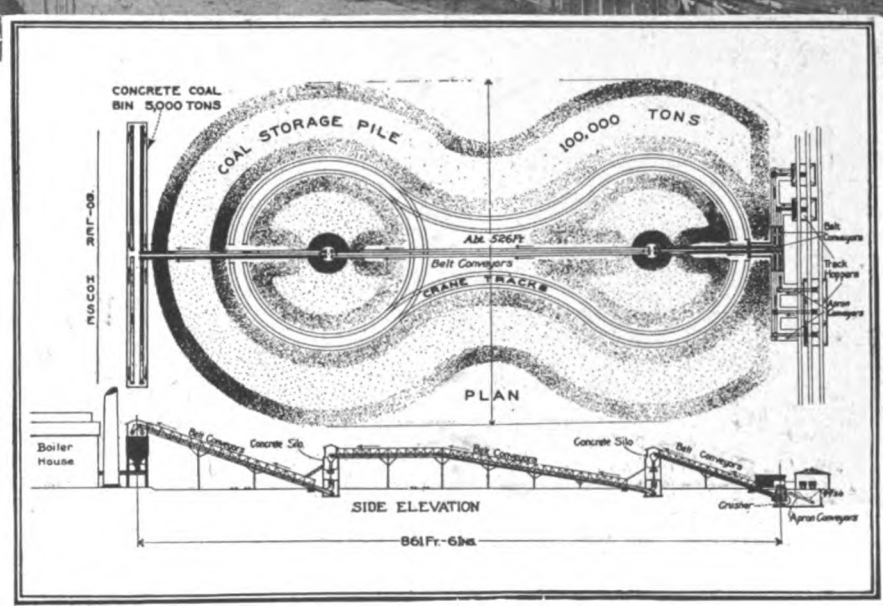
A Lake steamer fitted with wide belt conveyors for discharging its cargo of crushed stone.

Digitized by Google



multiple-pulley idler in general use at the present day is about what it was thirty years ago. Lubrication by grease is convenient in dusty, dirty places but under many operating conditions, it is neither certain nor efficient. Looked at from the standpoint of power consumed in turning the idler pulleys, the coefficient of friction with grease lubrication is not low: and considered from the standpoint of maintenance, neglected, the idlers wear out, there is an added and unnecessary strain on the belt, and the belt is apt to be scraped or damaged on idler pulleys that stick tight and then refuse to turn. Good belts will withstand a great amount of abuse, but it is expensive to permit it. There is no doubt that in many plants the high cost of belt maintenance is due to faults in idler construction and in the neglect of lubrication.

In order to prevent coal, ores and minerals from cutting and wearing the surface of the conveying belt it is necessary to load it in such a way that the material is delivered to it with some velocity in the direction of travel. It is possible to make a conveyor belt act as its own feeder, but with such material it is not profitable. This may seem like a trite remark, but it is a fact that some belts are still fed from side-delivery chutes, or are expected to take sudden rushes of heavy material, or are so placed that the material falls vertically onto them. It is well known that all of these arrangements are defective and that they serve to injure the belt.

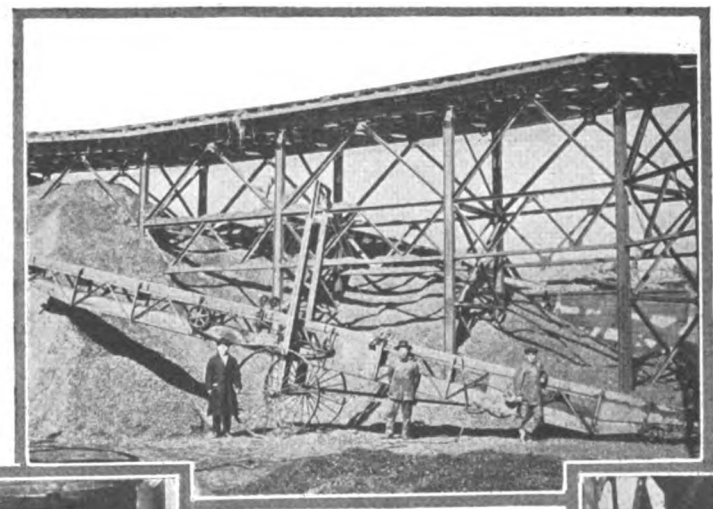


By combining belt conveyors with locomotive cranes, it is possible to store immense quantities of material and reclaim practically all of it at a rapid rate without expense for hand labor.

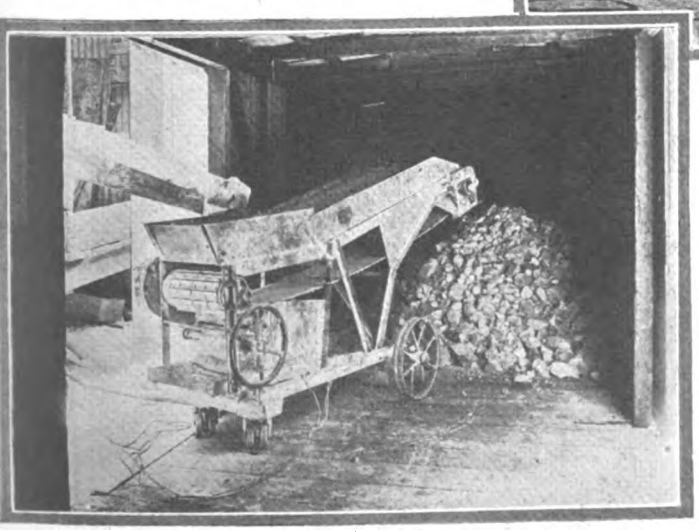
Feeders of various kinds are coming into more general use and in the future still more attention will be paid to the design of loading chutes. Screen chutes and chutes with stopped ends should be used oftener to handle run-of-mine coal and similar mixtures of lumps and fines. They permit the fines to reach the belt first and protect it from the sharp corners of the heavy pieces; the extra cost of the chute is more than saved in the longer life of the belt.

The tripper with its two pulleys bending the belt into an S form is no doubt the best means to effect a discharge

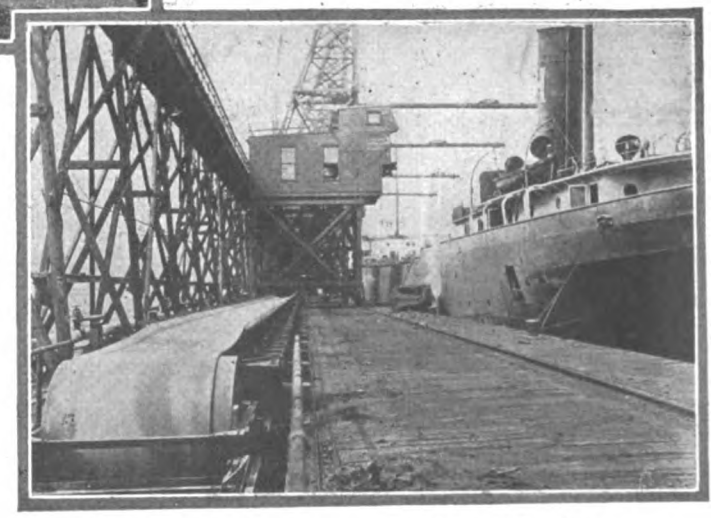
(*Continued on page 32*)



Even in Japan, with its low priced labor, it is found economical to store and reclaim coal by means of a portable belt conveyor.



A high speed self-contained belt conveyor used as a throwing machine to load box-cars.



A 54-inch 11 ply rubber belt 1,500 feet long handling run-of-mine coal. Has carried nearly 3 million tons in 6 years. Only partly protected from the weather.

Digitized by Google

The Deserted Power House

The Sub-Station That Does Its Own Thinking

BY OLIVER S. ARATA

YOU all have passed a deserted house and wondered what was in it. You all have thought of the possible spooks or ghosts that possibly roamed the floors, unmolested, of that particular, weird place. Did you ever pass a very modern structure, that did the work of a power house, and see it constantly closed?

Most likely you did not. Well, in St. Louis, Mo., the United Railways Company, which owns all the street railways of St. Louis, and is a very large corporation, has constructed some brick houses, one story in height, and when the five houses are completed the doors will be locked, and they will be apparently idle.

But the rotary converters, transformers, etc., used to furnish the power when needed, will not be idle at all times, for when needed for more power they are called in play by ingenious devices, described herein.

The automatic sub-station can adjust itself from the lightest load to the heaviest load required at the height of the traffic.



As the "deserted power house" looks, to the casual passer-by. Exterior of 300 kw. automatic sub-station on the St. Charles line, St. Louis.

When a load comes upon the station the automatic relays begin to function, and all in harmony.

One of the converters, at the slightest call, begins to operate, and changes a 440-volt alternating current to a 600-volt direct current, as is used in trolley wires. It is a perfect magician, for as the visitor stands there watching the boards, things begin to move as they possibly do in that haunted house you passed at dusk, or night.

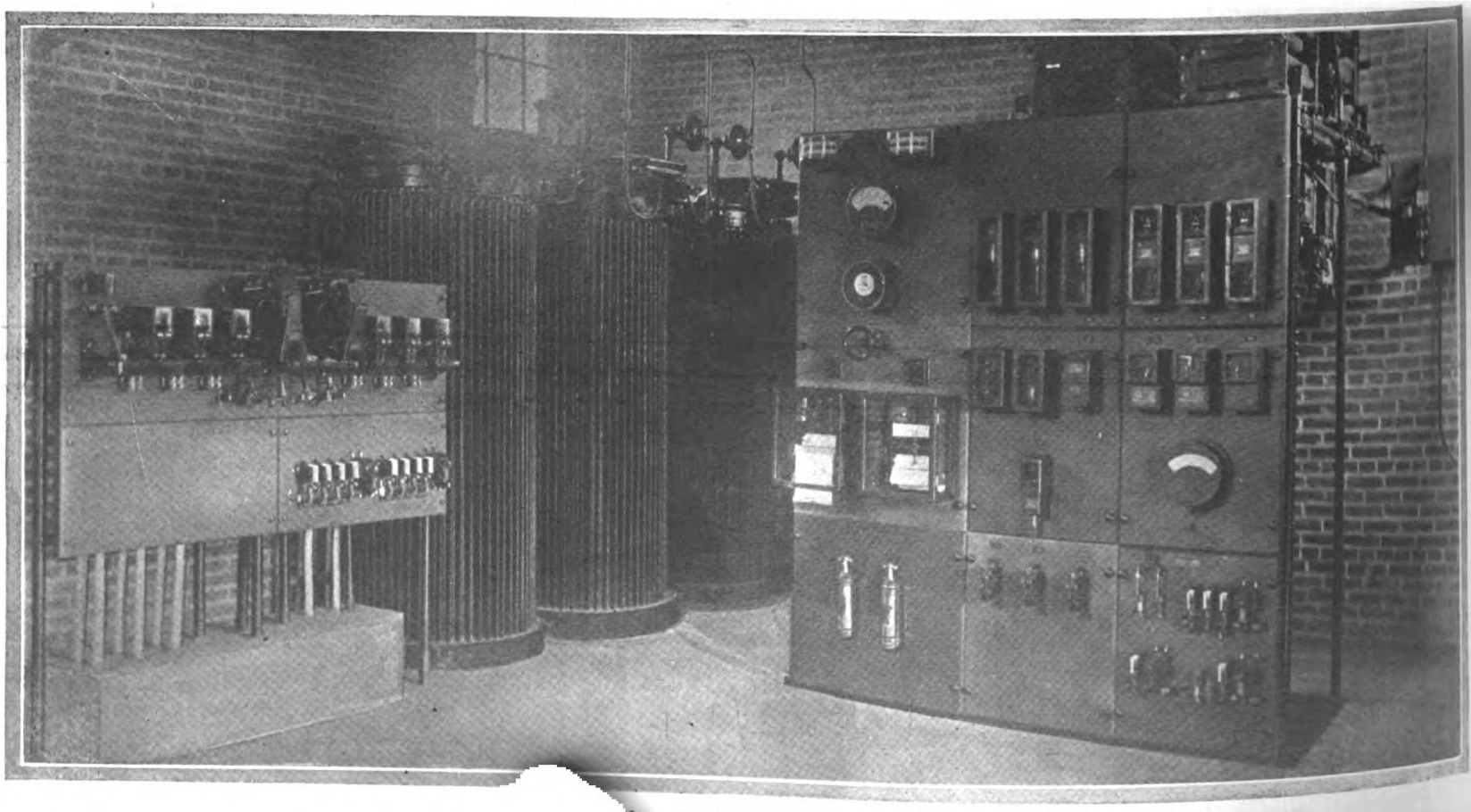
If you want to understand the working of a station you must know that as the load increases in the vicinity of a station, temporarily not in operation, the voltage drops. When the voltage drops to a predetermined point a relay then closes. This step brings the station into service.

When the relay closes other automatic devices do the work required by attendants, for one closes the high-voltage "oil-switch." The "oil-switch" supplies current to the rotary converter. Other devices protect during the starting period.

The "cutting-in" when the machine is ready to be placed on the trolley circuit is done by the use of so-called "load-limiting resistances," which limit the load to a safe figure.

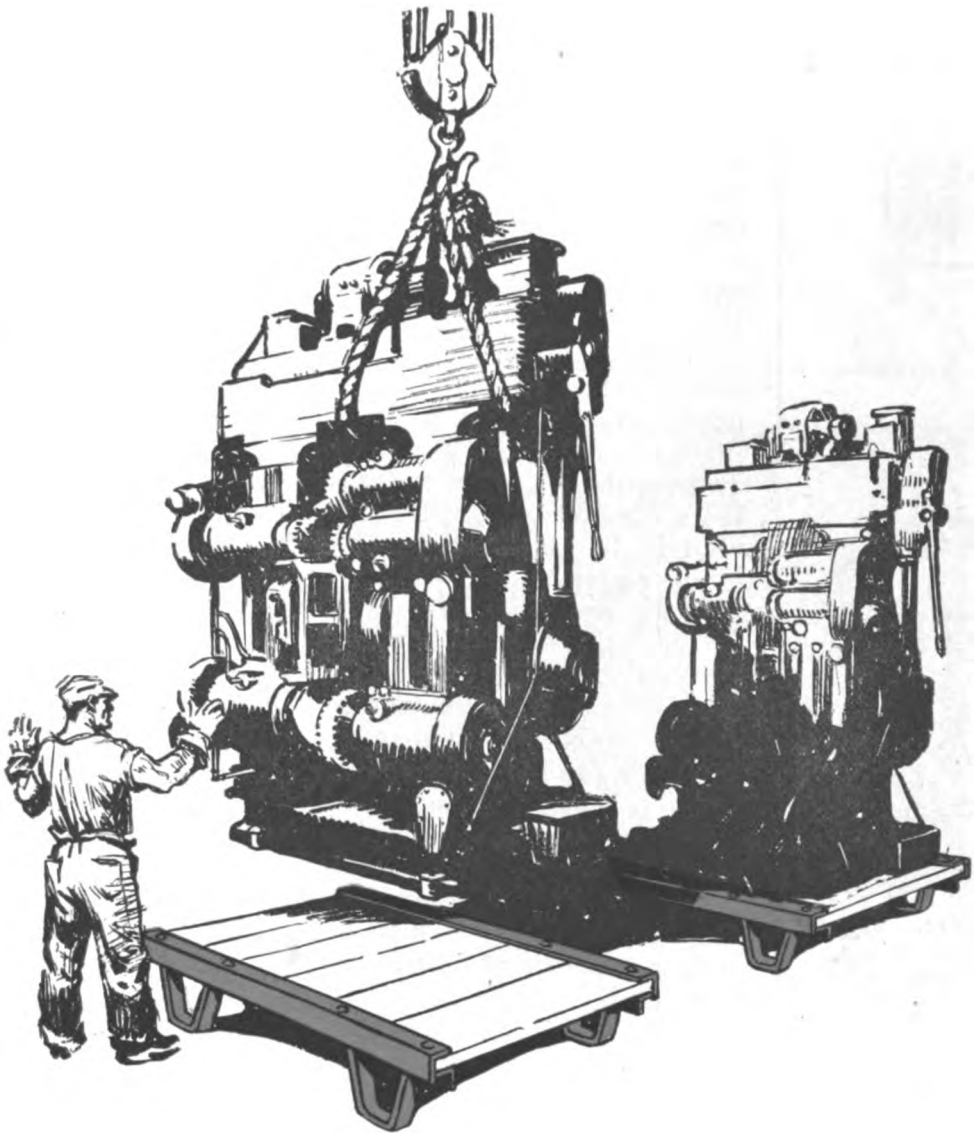
When the sub-station is no longer required it is temporarily cut out automatically, by use of other relays. A surbur-

(Continued on page 56)

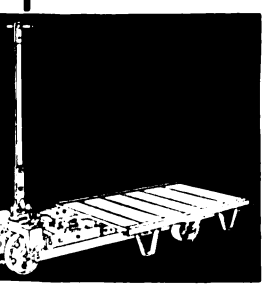


...e automatic sub-station; showing the ...nsformers, switchboards, and automatic relays.

Digitized by Google



Here's a platform powerful as the lift truck itself



ebing Steel-Bound Plat-ms match the Stuebing Lift ck in strength of build and ptability of service. They 't wear down or wabble

Your shop foreman will tell you that under average trucking duty the ordinary platform with nailed wooden legs has to go to the repair shop about every five weeks. A year's continuous service and it is ready for the junk pile.

Follow the example of hundreds of alert factories and terminals. Standardize on Stuebing "Steel-Bound" Platforms and save upkeep expense. Keep *all* of the money that your lift truck system is saving you.

Stuebing Platforms are built especially to stand the same severe loading and hauling duty the Stuebing Lift Truck has mastered. Powerful steel rails protect edges and corners of the oak top. Forged steel bolts clamp rails, top and steel legs together in a vise-like grip, binding the whole into a rigid, non-wabbling unit. Hence—"Steel-Bound!"

Stuebing Platforms can be used to full advantage with any make of lift truck—either hand or power-propelled. They come in various sizes, with carrying capacities up to 10 tons. They are easily fitted with stakes, bins or racks to handle any product.

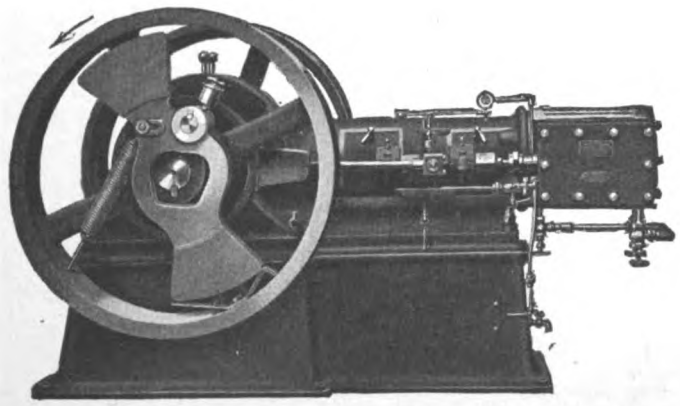
Stuebing "Steel-Bound" Platforms actually cost *less* than old-style nailed platforms, because they give unlimited service, and pay for themselves in the upkeep savings effected. Find out more about Stuebing Platforms. Write today for descriptive folder!

The Stuebing Truck Company, Cincinnati, Ohio; Montreal, Que.

StueBing

LIFT TRUCK SYSTEMS

Digitized by Google



The Big Features of a Small Engine

Many of the features of the small sturdy Troy Engines loom large when comparisons are made.

There's the self-oiling system which automatically supplies an abundance of oil to all bearings. The flow of oil keeps bearings clean and reduces wear to the minimum.

Then the Balanced Valve—an exclusive Troy Feature. This remains steam tight for years. The valve is balanced, except for sufficient pressure to hold its seat, yet operates freely and will relieve the cylinder of condensation—making the Troy the safest small engine.

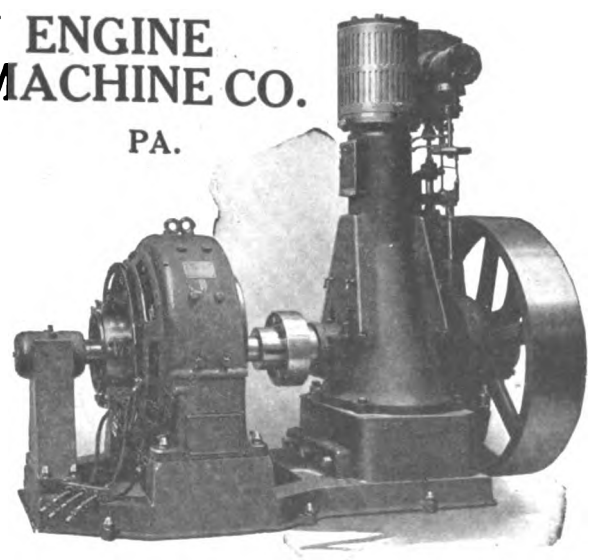
These and other exclusive Troy features are reasons for the decision of prominent stoker manufacturers for standardizing on Troy Engines for stoker operation.

For fans and blowers, for exhausters in gas plants and as auxiliaries to larger prime movers Troy Engines are the logical choice because they are economical in operation, require the minimum of attention and run for years without breakdown.

All well worth remembering when a small engine is required.

TROY ENGINE & MACHINE CO.

TROY, PA.



Write for the TROY Catalog

TROY ONLY STEAM ENGINES GOOD ENGINES ONLY **ENGINES**

Feed Water Treatment

(*Continued from page 20*)

water if he could see a certain pumping station out in Ohio where softened water is used and where the boilers have not been cleaned since 1915.

Pure water does not exist in Nature, since it will dissolve nearly everything with which it comes in contact. Heat and evaporation in the boiler leave these dissolved impurities behind in the shell. Since the large majority of all boiler troubles are directly traceable to the presence of these impurities, the careful consideration of the best and most economical methods of rendering water fit for boiler feed purposes is warranted in nearly every instance.

Broadly speaking, there are two methods of softening boiler feed water. It may be treated after it has been fed into the boilers, or it may be softened in specially designed tanks before feeding.

Many compounds are on the market for use in softening water within the boiler itself. Some act chemically, to precipitate the soluble salts; others act mechanically, to loosen scale from the boiler surfaces after it has already formed. In either case the resultant sludge settles to the mud drum and is blown out of the boiler at periodic intervals.

The use of boiler compounds has the advantage of low first cost and simplicity of operation. Blowoff losses are considerable, however, and it is not always possible to correctly gauge the amount of compound necessary to properly treat the water. In many plants, however, the first cost of a more elaborate system would make it prohibitive. In such cases, properly selected boiler compounds, intelligently used, materially reduce boiler operating troubles, thereby reducing production costs to a corresponding degree.

Certain salts are found to be soluble in cold water, but insoluble in hot water. When these are present in boiler feed, it is said to be temporarily hard. Such water may be treated before it enters the boiler by passing it through an open feed water heater, which is provided with a settling tank of ample capacity to allow the precipitated salts to settle.

Permanently hard water, however, is not affected by heat treatment and must be softened by the use of chemical principles. One method is to precipitate the salts by suitable reagents, usually lime and soda. Large settling tanks and suitable filters are provided with this system. Considerable time must be allowed for settling, and some installations are provided with two tanks, one delivering softened water, while the other is treating the raw water. Another type consists of a single basin of sufficient capacity to allow ample time for settling as the water flows slowly from the inlet to the outlet. This type is often equipped with heaters, the hot water permitting quicker action and smaller tanks. Such operation is continuous.

Where the percentage of impurities is variable over a wide range, the intermittent type of softener offers ample opportunity for determining the proper proportions of chemicals to be added, since the taking of accurate samples of water for analysis is readily possible.

Zeolite softeners operate on an entirely different principle and remove the hardness from the water by allowing it to percolate through a bed of zeolite material. In this process the zeolite exchanges its sodium base for the calcium and magnesium bases of the salts in the water. A meter indicates when the flow of water has reached the capacity of the tank, indicating that the zeolite has become saturated. The material must then be regenerated by reversing the process and passing a salt solution through the zeolite tank, replacing the acquired calcium and magnesium bases in the zeolite with the sodium base in the salt. In 24-hour plants, one zeolite tank is regenerated while a second tank is softening and delivering water.

Too much stress cannot be laid upon the importance of accurate first-hand knowledge

Digitized by Google

of feed water impurities, if any treatment at all is going to be successful. Perhaps a condition exists that calls for treatment by a combination of two or more of the systems described, or perhaps a single simple method will do the work. These are good things to know before the money is spent.

It is well to bear in mind, however, that the mere fact that you have installed the "finest water softening plant in the country," will not automatically reduce your production costs nor eliminate your boiler troubles. Equipment may be 100 per cent. perfect in itself, but its efficient operation depends solely and entirely upon the men who operate it. It would be folly to put an elaborate outfit in a place where it will have unfair treatment or unintelligent and half-hearted supervision. The human element will determine whether your softener is a water softener or a "white elephant."

The writer has in mind a 2,000 horsepower plant in New Jersey, where there was installed a "beautiful" water softening outfit. In spite of this fact, scale and boiler troubles were unusually bad, sometimes accumulating to a depth of ½ inch in two weeks. It was not unusual to have two boilers off the line at the same time for cleaning purposes, thereby reducing the capacity of the boiler house to 60 per cent. of its normal value. Additional capacity was needed and a new boiler had been ordered.

At about this time the writer was called in to give an opinion and to prescribe a remedy, if he could. At his suggestion, samples of the feed water were taken at the source of supply, at the point where the water entered the softener, at the discharge and at the point where it entered the boilers. Analysis of these samples showed that the water was very bad at the source and at the softener inlet. The water coming out of the softener, however, was very good, but the water entering the boilers was very bad again. There was only one answer to the problem,—raw, untreated water was entering the system at a point between the softener outlet and the check valve at the boiler. The possibility of a by-pass in the feed water system was suggested to the chief engineer, but he said there was no such thing. The superintendent was then appealed to and he ordered every inch of the system explored until the by-pass was found. When it was finally located, the valve was seen to be wide open. There is no more trouble in that plant from bad feed water. And the order for the new boiler was canceled.

In this article the writer has attempted to show that feed water treatment is a real live problem, even in the plant where the water is known to be good. But guesswork was never known to make hard water soft. If worthwhile results are to be obtained accurate knowledge is necessary, after which the proper method of treatment may be selected to suit the conditions, always bearing in mind the human element that is going to mishandle the pesky thing.



Arex engineers reveal hidden profits in every industrial field

VENTILATION performs its *greatest* service in the industries.

Not only does it make the workers of America healthier, happier and contented, but in thousands of instances it saves actual dollars every minute by reducing material losses and speeding production.

Arex engineers for more than fifteen years have been correcting profit destroying conditions of every nature. Steam, smoke, heat, fumes, foul air, gas—any menace that may exist in your building has been successfully handled by these experts many times before.

Their corrective system of siphonage ventilation which requires no power equipment is practical for a single room or an entire factory. The low first cost and expense of installation will surprise you—in many cases the savings effected balance them within a few months.

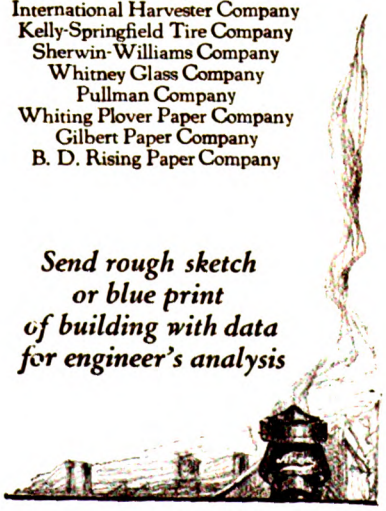
Put your problem before these engineers for consideration. The specification blank below will bring you a complete survey without cost or obligation. Attach rough sketch or blue print of building and address Arex Company, Engineering Division 1583 Conway Building, Chicago.



World-known leaders in every branch of manufacturing are found on the list of Arex Installations:

Carnegie Steel Company
Packard Motor Company
Bethlehem Steel Company
American Steel & Wire Company
American Car Company
Ford Motor Company
Armour and Company
Standard Textile Products Company
Studebaker Corporation
Stewart Mfg. Corporation
Semet-Solvay Company
Cadillac Motor Company
Sinclair Refining Company
Corn Products Refining Company
Crane Company
International Harvester Company
Kelly-Springfield Tire Company
Sherwin-Williams Company
Whitney Glass Company
Pullman Company
Whiting Plover Paper Company
Gilbert Paper Company
B. D. Rising Paper Company

Send rough sketch or blue print of building with data for engineer's analysis



AREX COMPANY
J. C. Kernchen, Pres.
INDUSTRIAL VENTILATING ENGINEERS

Arex Ventilation Engineering Survey SPECIFICATION BLANK

We desire to receive *Gratis* an engineer's analysis of the following building: ..... *State character of work or business building is used for*

We are troubled with: Fumes ☐ Smoke ☐ Foul Air ☐ Heat ☐ Condensation ☐ Steam ☐

Dimensions of Building: Width ..... Ft. Length ..... Ft. Ceiling Height ..... Ft.

Construction of Building: State whether Brick ☐ Concrete ☐ Frame ☐ Stucco ☐

Type of Roof: State whether Flat ☐ Slant ☐ Gable ☐ Sawtooth ☐ Monitor ☐

Pitch of Roof ..... State how many ..... inches to the foot .....

Location of Floor or Room to be ventilated .....

How high do adjoining Buildings extend over your Roof? .....

How many feet distant are the surrounding Buildings, or is your Building entirely unsurrounded? .....

..... Firm Name ..... Name of Individual ..... Title of Individual

..... Street Address ..... City ..... State

Digitized by Google

What Cooper Union Means in the Engineering World

By May Wilkinson Mount

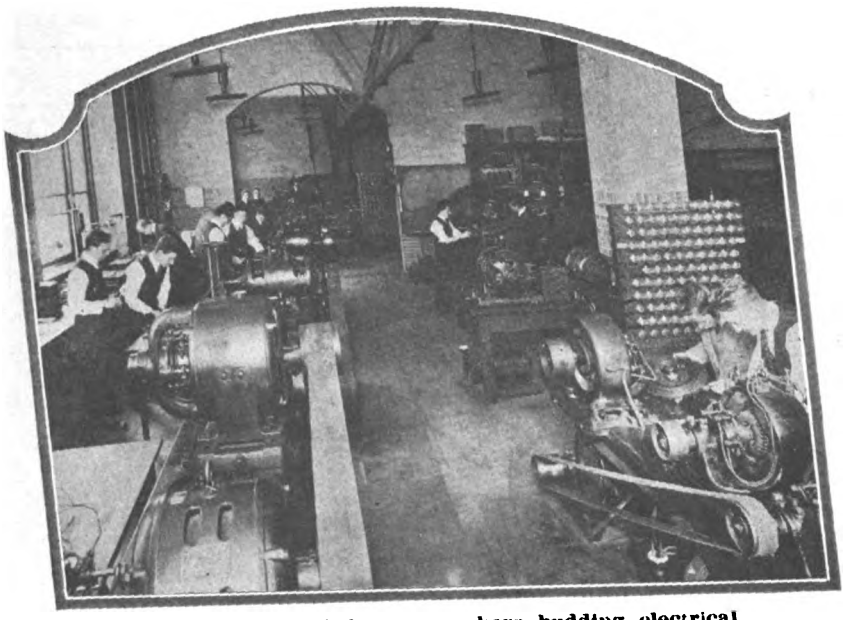
"SINCE Cooper Union raised $400,000 for the increase of teachers' salaries it has been the wish of its friends that a building fund might be provided for the erection of the much-needed upper floors planned to complete the Hewitt Memorial Building."

I read this announcement in the morning paper as the Third Avenue elevated train whirled past Cooper Square and the big brown building on Fourth Avenue and Eighth Street flashed, from its many windows, a smile caught from the morning sunlight.

Where could help be more effectively bestowed!

The long foundation of Hewitt Memorial Building glided by. Here is housed the splendid engineering equipment of Cooper Union; an equipment as complete as that of any university, although more restricted in quantity for lack of space.

How many who ride on the subways know that Ludwig A. Zima, electrical engineer of the Interborough Rapid Transit, won his degree in Cooper Union; that John F. O'Rourke, New York's most prominent engineering contractor; Allen Stirling, inventor of the Stirling boiler, and William Kent, author of "Kent's Mechanical Engineering Pocket Book" and a consulting engineer of note, won their professions in the old-fashioned building which Peter Cooper's vision and philanthropy erected for the use of all who were capable of achieving prominence in their ideals and who had not the opportunity to develop them?



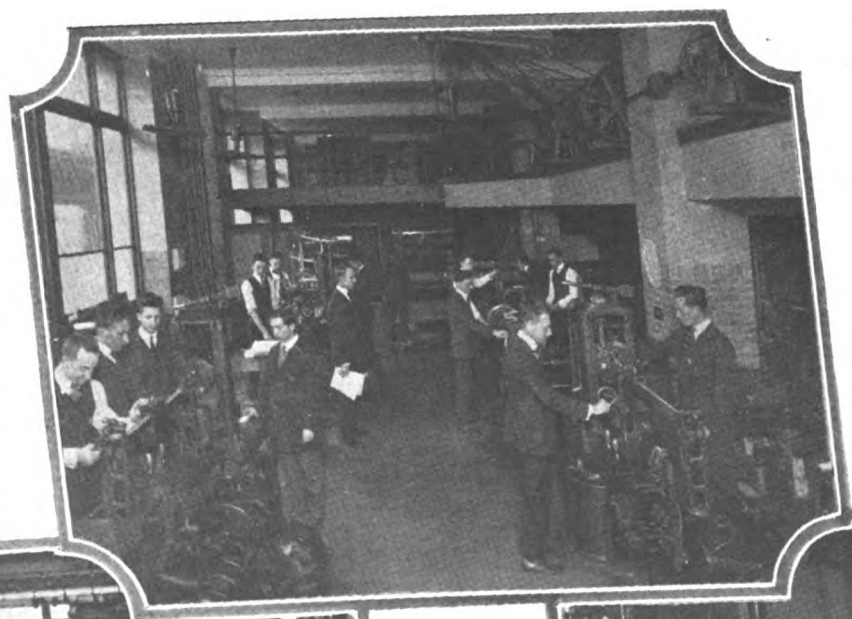
The Dynamo Laboratory, where budding electrical engineers receive practical instruction.

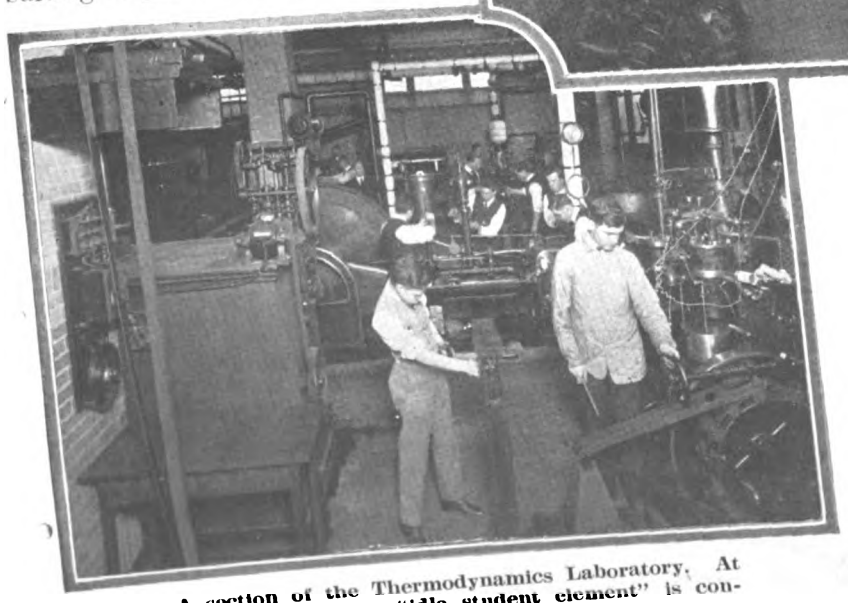
Year after year young men and women have graduated from Cooper Union's classes in arts, sciences and letters, every one of them an expression of the best brains in the city's fibre, for it must be remembered that lack of room and length of application lists makes it a necessity for Cooper Union to accommodate only the best material offered. Out of 1,500 youths who sought entrance into engineering courses this term, for instance, only 200 could be accepted. Only 300 are working in those modern laboratories where toilers of the day strive to lift themselves to heights in their chosen profession at night.

They succeed. The list of successes is long and brilliant. There are Edward A. Miller, Chief Engineer, Department of Parks for Manhattan and Richmond; George W. Rink, assistant superintendent of motive power, Central Railroad of New Jersey; Theodor S. Oxholm, Chief Engineer, Borough of Richmond; D. R. Lovejoy, manufacturer and inventor of atmospheric products

(Continued on page 42)

Below—Upper floor, Nationals Testing Laboratory.



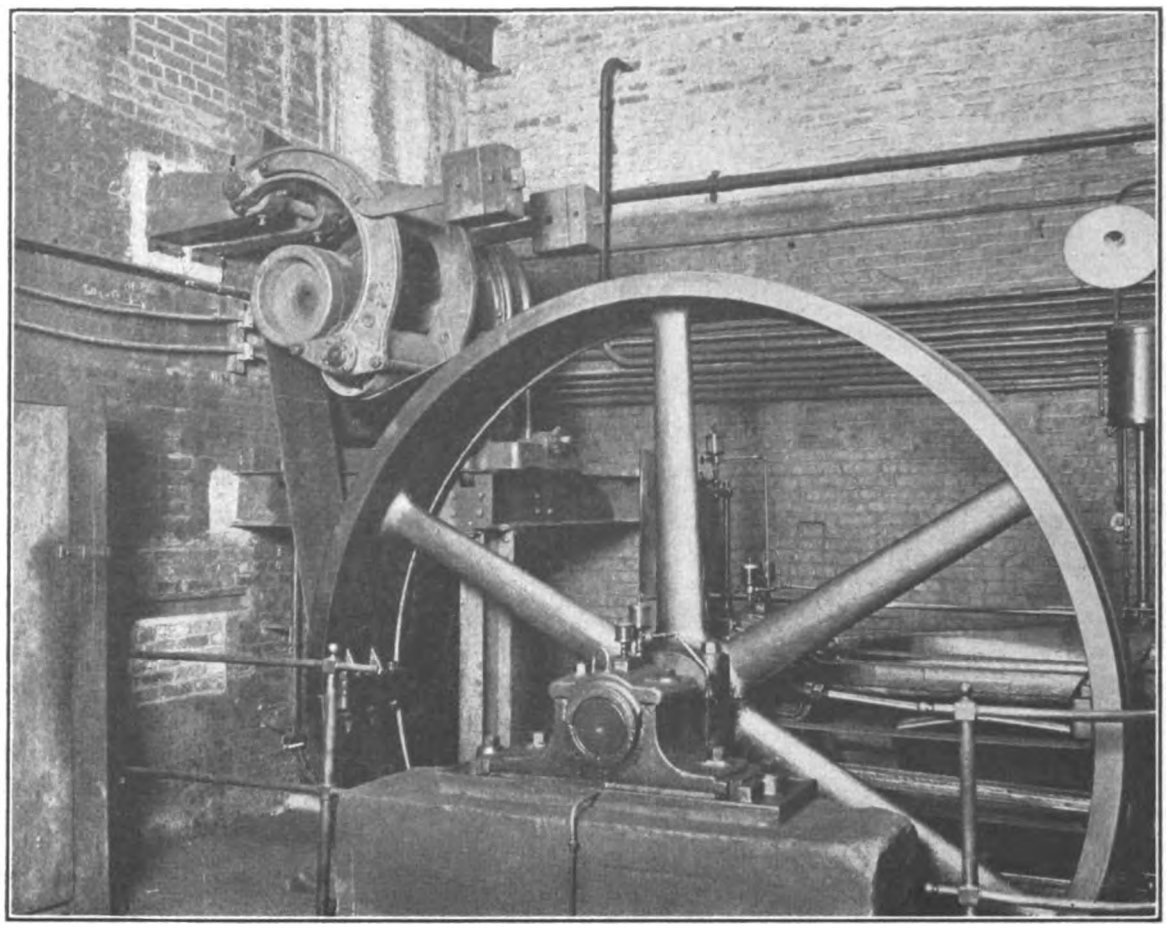


A section of the Thermodynamics Laboratory. At Cooper Union, the "idle student element" is conspicuous by its absence.



Materials Testing. Considering past accomplishments, Cooper Union is surely entitled to support in its ambition for enlarged facilities.

Digitized by Google



Engine driven 90 K.W. Alternator, Alternator Pulley 17" dia. 18" face. 900 r.p.m. Flywheel 10' 0" dia., 22" face, 126 r.p.m. Pulley Centers 7' 6".

An Achievement in Belting Engineering

Five Points

1—The Lenix increases the arc of contact between belt and pulley.

2—The Lenix maintains constantly and accurately the proper tension in the slack side of the belt.

3—The Lenix saves floor space, building space and belting because of freedom in pulley locations.

4—The Lenix saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The Lenix permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

The installation illustrated above shows the possibilities of the LENIX drive. Most people would have thought this impossible but to the LENIX it was simply another opportunity to demonstrate its ability to transfer power from one pulley to another regardless of the relative positions of the pulleys.

You may never have as unusual a belting problem as to this solve, but you will always want to save FLOOR SPACE—you will always want to save POWER.

The LENIX by "wrapping" the belt around the pulley makes the short center drive not only possible but preferable. The belt is held against the pulley surface by a pressure that is constant and accurate regardless of load, atmospheric conditions or belt stretch. Slippage is eliminated.

There are more than 3,000 LENIX drives in operation in this country. There would be some in ***your*** mill if you were familiar with the advantages of this drive. You can get the facts by writing for a copy of *"Saving Slippage and Space."*

F. L. SMIDTH & CO.

ENGINEERS

50 Church Street **New York, N. Y.**

THE LENIX DRIVE

Digitized by Google

The Future of Belt Conveying

(Continued from page 25)

from a moving belt between the terminals of the conveyor. In its present form it is practically what it was fifty years ago, except that users of belt conveyors have come to understand that the light frames and small pulleys of old-time trippers are not good construction. To keep the belt running straight, the frame must be stiff and strong, and to lessen the injury to the belt by the reverse bending, the pulleys must be reasonably large. These features are embodied in the best trippers, but should be in more general use.

Further improvement in belt conveyor accessories will come in response to a demand for lower operating costs. The principal items in these costs are charges for care and maintenance, for power and for interest and depreciation. The prime cost which underlies all these charges is the cost of human labor, and in spite of some reductions and fluctuations, it seems certain that labor costs for years to come will not fall to the level of 1914. The high price of labor is quite evident to the owner of a belt conveyor when he pays wages and repair bills, but it is not so apparent in the bill he gets from the power company, or in his bills for bank interest. Nevertheless the price of labor is the fundamental basis of these items of expense also. There will be for years to come, in all branches of industry, a constant effort to reduce operating costs; this will lead to the greater use of labor-saving machinery, and a demand that belt conveyors as well as other kinds of conveying machinery shall be more efficient and cost less to run.

If belt conveyors could be run with no attention at all, the charge for care and supervision would be zero; but while that is not possible, it is practical to use belt conveyor equipment that will reduce greatly the charges for care and oversight. Belt idlers with ball bearings or roller bearings are steadily coming into use as a means to this end. In several idlers of this kind which have passed the stage of trial and introduction, the charge of lubricant is so confined by packing, and dust and dirt are so excluded, that one filling of lubricant lasts for months. This makes a direct saving in lubricant, but what is more important, it avoids most of the expense for filling and adjusting the screw-top grease cups with which the ordinary belt conveyor idler is fitted. In large plants where it takes several men to look after the belt conveyors, this saving is immediate and important. In small installations, where one man looks after all the machinery, the direct saving may be slight, but the added cost of the improved idlers may be saved in the lower charges for belt repairs and renewals.

Idlers with ball bearings or roller bearings revolve with so much less friction than pulleys with plain, grease-lubricated, bores that the saving of power is an important item. There are more than a dozen cases on record where the direct saving of power has been about 30% and in some very long conveyors, the saving has been as much as 50%. In small conveyors lightly loaded, the reduction in the cost of power may not be sufficient to justify idlers with ball or roller bearings, but in a permanent installation of long or hard worked conveyors carrying coal, ores or minerals, there is a better opportunity to show the direct saving and the ultimate economy in the use of the more expensive idlers.

Careful comparisons of costs of handling have shown in recent cases that as between a system of mine-car haulage and a system of belt conveyors four and a half miles long, the choice on the basis of ultimate cost per hour of material carried would be against the belt conveyors if they had ordinary grease cup idlers; but if the conveyors were equipped with improved idlers, the reduced cost of power and of care and maintenance, would make the conveyor system show a decided saving. In these comparisons, other factors in favor of the improved idlers were:

1. The pull in the belt is so much less that a thinner belt, and hence a cheaper belt, can be used. The belt will be

(Continued on page 34)

From
Receiving to Shipping
all through the plant—in every department—Cleveland Tramrails will greatly reduce the time, labor, and cost of handling your products.

No system has ever been devised that so adequately adjusts itself to every hoisting and conveying need, requiring two tons or less capacity.

It's easily installed—just like hanging a pipe line. The entire system is standardized—permitting additions whenever necessary. Corners can be turned; carriers switched from one rail to another; and elevators equipped to hoist carriers from one floor to another. It will even travel up a 12½ degree incline. In fact it will go anywhere—from cellar to attic—indoors or outdoors.

There is a Cleveland Tramrail installation that will serve your individual needs.

We would prefer to analyze your plant and suggest the proper installation. May we?

Our catalogue may interest you.

CLEVELAND ELECTRIC TRAMRAIL
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE OHIO.

Sales Offices:
50 Church Street New York City
149 E. Larned St. Detroit, Mich.
Farmers Bank Bldg. Pittsburgh, Pa.
1418 First National Bank Bldg. Chicago, Ill.

CLEVELAND
HAND OR ELECTRIC TRAMRAILS

Digitized by Google

The Versatility Of Hyatt Bearing Conveyors

Speeding Up Materials Dependably At Lower Cost

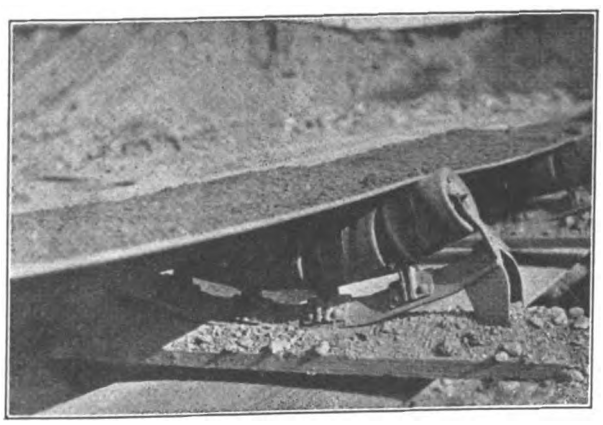
Whatever type of material you have to handle, Hyatt bearing conveyors will do the work more quickly, more dependably, at a lower cost. In all industries,



Ore: *Heavy, abrasive. Hyatt bearing equipped conveyor drive at Phelps Dodge Corporation, Tyrone, New Mexico, installed in 1915. They report "Ultimate life of Hyatt bearings unknown, maintenance very low, service excellent".*

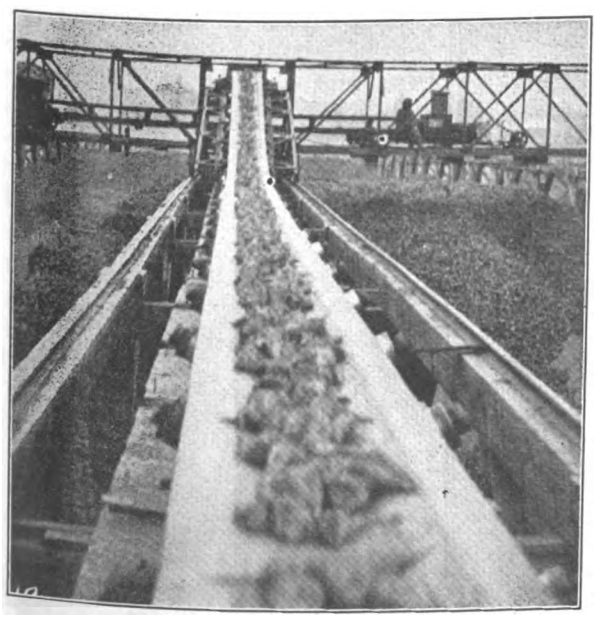
handling all varieties of materials from fragile, light loads to heavy, abrasive loads; conveyors with Hyatt bearings built into their idler, head, tail bend and snub pulleys are

Sand: *Exposure to elements does not affect the dependable, economical operation of Hyatt bearing idlers on sand and gravel conveyors such as this one used by the Rubber City Sand & Gravel Company, Akron, O.*



proving their worth day after day.

Power Saving: The elimination of at least 50% of the friction of plain bearings makes possible the use of

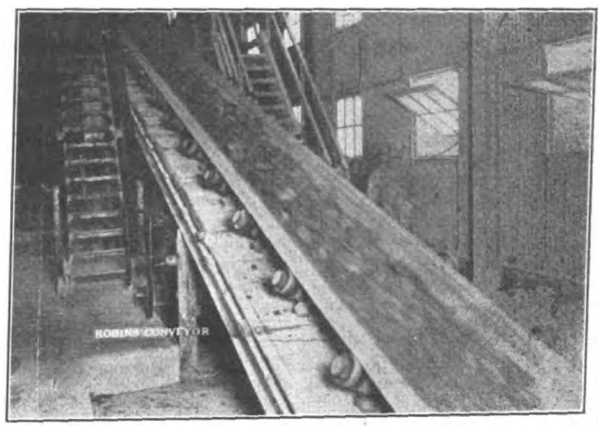


Beets: *Dirt and moisture conditions surround conveying of beets and beet pulp. Great Western Sugar Company says, "Our Hyatt bearing beet conveyors are the best installation of the kind of which we have any knowledge".*

smaller driving motors, lighter head and tail pulleys and reduces operating power costs.

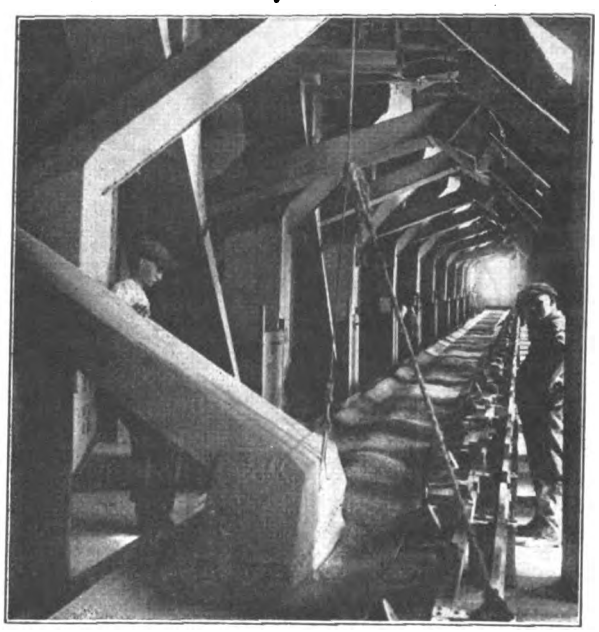
Belt Cost (Initial and Replacement): The reduced friction in idler pulleys allows the use of lighter, less costly belts. When 6-ply belts can be used in place of 8-ply belts a considerable saving in first belt costs and belt

Limestone: *Extremely abrasive. 10% of the World's limestone carried by Hyatt equipped conveyors at Hillsville, Pa. plant of the G. W. Johnson Limestone Company, subsidiary of Carnegie Steel Company. Constant operation for five years, no time lost, not one cent for repairs to date, lubricate three to four times a year.*



replacement costs results.

Maintenance: Hyatt bearings are durable and operate



Grain: *High speed, thick dust. Seventy-five Hyatt bearing conveyors (4½ miles long, 32,000 bearings) at Pennsylvania Railroad elevator, Baltimore, Md., handle forty cars of grain per ten hour day. No time lost for repairs, lubricate three to four times a year, no hot bearing fire hazard.*

for many years without requiring adjustment or replacement.

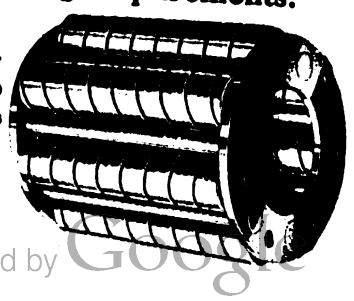
Lubrication: Hyatt equipped conveyors require greasing only three to four times a year. A real saving in grease and the labor to apply it.



Coal and Slate: *Heavy shock impacts under loading chutes. The coal for all the coke to supply the United States Steel Company plants is carried on five Hyatt bearing conveyors at Unites States Coal & Coke Company, Lynch Mines, Ky.*

It will pay you to investigate the advantages of Hyatt bearing conveyors for your material handling requirements.

HYATT ROLLER BEARING CO.
Newark Detroit Chicago San Francisco
Worcester Milwaukee Huntington Minneapolis
Cleveland Pittsburgh Buffalo
Philadelphia Indianapolis



Digitized by Google

(Continued from page 32)

lighter and less power will be required to keep it in motion.

2. Since there is less chance that the pulleys will refuse to turn, the risk of injury to the belt is less.

When a modern rubber belt successfully and economically carries hard ore in jagged pieces weighing 200 pounds or more, and when canvas belts are regularly used to convey all sorts of heavy merchandise and packages, we may say that the art of belt conveying has made progress. Such uses would not have been practical 30 years ago, and we may safely say that 30 years from now belts will be doing work that is not now thought of.

Great developments may be expected in the use of package conveyors. For years these were confined to department stores, but more recently they have been used in post-offices, in express terminals, and in manufacturing plants of all kinds. The article "Handling 3,000 Tons of Mail a Day" in the recent January number of "Industry Illustrated" shows the trend of the times in a recent installation where 71 conveyors using 8 miles of wide belt will be used to collect, sort, distribute and dispose of an immense quantity of parcels post mail matter. This plant may be considered the forerunner of other mail handling plants of this type.

In shops and factories belt conveyors will be used more and more to carry raw materials to machines, partly-worked goods from one machine to another, and finished goods to storeroom or to cars. In the form shown in the upper and lower left-hand pictures on page 24, both runs of the conveyor can be used at the same time, and in shops designed for the purpose and with the machines or operators' benches arranged alongside the conveyor, the output of the workers can be increased while the cost of handling is greatly reduced.

It is also probable that great economies in costs can be effected by novel combinations of belts with other means of handling materials. It is not so many years since the first lake steamer was fitted with a belt conveyor to assist in discharging its cargo; now there are a number in use in which a belt conveyor over the keel draws coal or stone from a hoppered bottom, an inclined belt elevates it, and another belt in a pivoted boom finally discharges it on the wharf alongside the ship. There are possibilities in the greater use of belt conveyors in discharging ships' cargoes. The same may be said of the combination of belt conveyors with locomotive cranes for storing and reclaiming large quantities of coal, ore and similar materials in the open, and in the greater use of portable belt conveyors.

Even in Japan, where labor costs are low, it has been found profitable to use portable conveyors to store and reclaim material which a few years ago was moved by human muscle only. High speed belts for throwing material into the ends of box-cars or trimming coal in the holds of ships are instances of new uses of belt conveyors; it is probable that other uses for high speed belts



How electricity has compelled swift advances in steel founding

WHEN the electric furnace first made possible a higher pouring temperature than could be attained with the open hearth, foundry practice for many years lagged behind the advance made in melting.

Molds, sands and inspection

New molding methods had to be devised to accommodate the hotter metal. New devices for testing and controlling sand mixtures had to be created. New ladle linings had to be compounded. More rigid and systematic inspections—both of the interior and exterior of the castings—had to be installed and enforced.

Research and swift progress

Only in the last three years have these and many other necessities been achieved—and then only through the combined efforts of the Electric Steel Founders' Research Group. To the industry as a whole this means that more is now known about the art of organized steel founding than has ever been known anywhere before.

Send for these bulletins

To the purchaser it means—among other things—that in many cases he can now replace gray and malleable iron with exceptionally strong, tough, and elastic steel costing less for the part than iron costs. For additional information send for our D series of 28 bulletins briefly describing the work of the Electric Steel Founders' Research Group and the Electric Steel Company.

Electric Steel Company · 31st and Wood Streets · Chicago

ELECTRIC STEEL COMPANY

Digitized by Google

will be discovered and developed in the future.

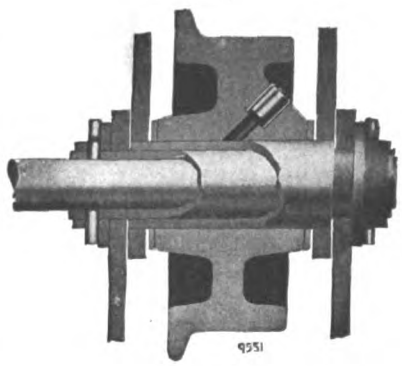
When material is once safely settled on a belt, it can be conveyed, so far as the belt is concerned, just as easily at 1,000 feet per minute as at 200 feet per minute, provided the resistance of the air does not blow the material off. At present, belt speeds for most materials are kept relatively low to suit the ordinary conditions of loading the belt and to avoid excessive friction losses in the supporting belt idlers. By the use of improved idlers the friction losses can be reduced greatly, and by means of improved loading devices and chutes, the delivery to the moving belt can be made with less cutting and abrasion. It seems likely, therefore, that with more attention paid to these points, ordinary belt conveyors can in the future be run safely and economically at speeds higher than what is now considered good practice.

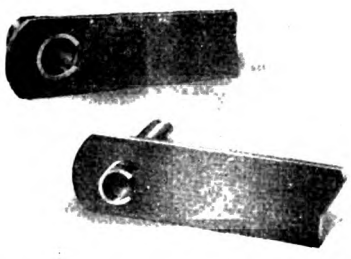
The use of a series of belt conveyors in tandem to convey coal 4½ miles has been referred to in this article. Such a system composed of 22 belts 48 inches wide and up to 1,500 feet centres is now under construction, and a 10-mile system with 60-inch belts is under consideration. What has made such a system possible is the use of supporting idlers with ball or roller bearings and a greater permissible belt tension. Twenty years ago it was not considered proper to stress a conveyor belt higher than 18 or 20 pounds per inch of width per ply of thickness, but with better belts and greater experience in the use of belts, it has been found safe to run the tension up to 30 pounds per inch per ply. With continued improvements in the manufacture of belts, some of which have been referred to, it is not improbable that belts may be stressed even higher and that belt conveyors 2,000 feet centers may become as commonplace as 500-foot conveyors are now.

The progress of belt manufacture may be appreciated when we remember that the first rubber belt used for grain conveying 60 years ago was only 18 inches wide, 2 plies thick, and less than 100 feet long, and that in conveyors for heavy substances, there were, prior to 1900, very few over 24 inches wide. In 1915 the largest belt in use was 54-inch, 11 ply, 1500 feet long and in 1917 there were several 60-inch, 12 ply belts over 2,000 feet long in active service. Since that time 60-inch belts are not unusual and in some of the large rubber belt factories, they are made in the general course of business without exciting comment.

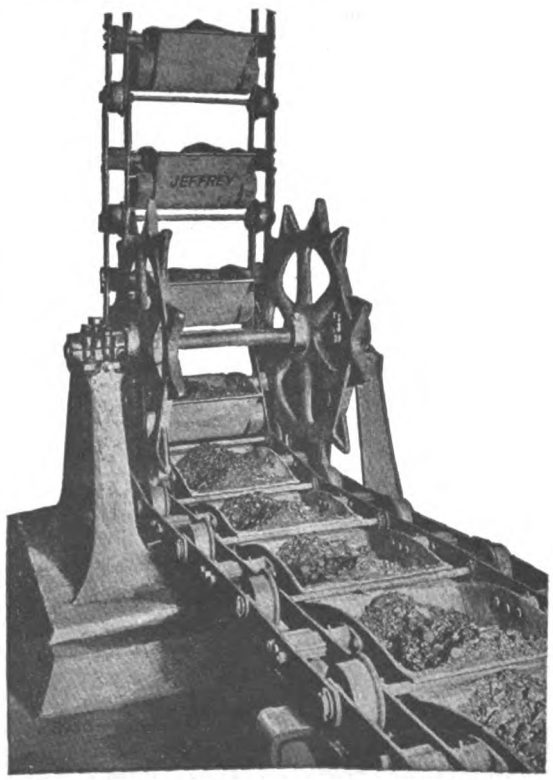
The difficulties in the way of making belts wider than 60-inch and thicker than 12 ply, are not very great and it is probable that they could be supplied. A 10-foot wide belt will of course carry four times as much as a 5-foot wide belt at a given speed and it is conceivable that to give a certain capacity a single 10-foot conveyor might be cheaper and better than four conveyors 5 feet wide under certain conditions.

All Wear In The Jeffrey Carrier Chain Joints Is Confined To The Renewable Glass Hard Steel Bushings





Showing how lugs in the steel side bars are locked tight to notches in both ends of the bushings.



The life of any Pivoted Bucket Carrier in rigidity and in proper action on its driving wheels depends almost entirely upon the life of its chain joints—therefore the Jeffrey Carrier is equipped with Chains made of tough steel side bars with hardened double bushings.

These two steel bushings are assembled one within the other, the outer one fixed to the inside bars and the inner bushing fixed to the outside bars. The outer bushings serve as bearings for the chain rollers, while the inner bushings act as chain pins and receive the carrier cross rods.

The lugs in the steel side bars are locked tight to notches in both ends of the bushings. Thus all wear is confined to the bushings which may easily be replaced after long service and a practically new chain obtained at very little cost.

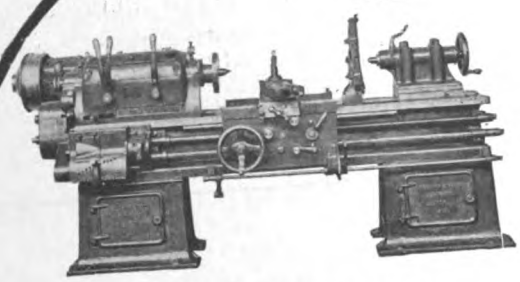
At The Ford River Rouge Plant A Jeffrey Carrier Is Demonstrating Its Economy And Efficient Performance

The Jeffrey Manufacturing Co.,
946-99 North Fourth Street Columbus, Ohio

JEFFREY
MATERIAL HANDLING MACHINERY

Digitized by Google

REED-PRENTICE
MACHINE TOOLS
WORCESTER, MASS. U.S.A.



All the users are big boosters for it.

THE unapproached daily service given by Reed-Prentice Geared Head Lathes in hundreds of plants gives them nation wide prestige.

Advanced design—more accurate and rugged construction—handy simplified control—and a dozen other superior features—set Reed-Prentice Geared Head Lathes as a standard by which others are compared.

They are built in sizes 12"-14"-16"-18"-24"-27".

We will gladly explain all their fine points. Which size are you considering?



REED-PRENTICE CO.

LATHES-RADIAL DRILLS
BECKER MILLING MACHINES
MILLING CUTTERS

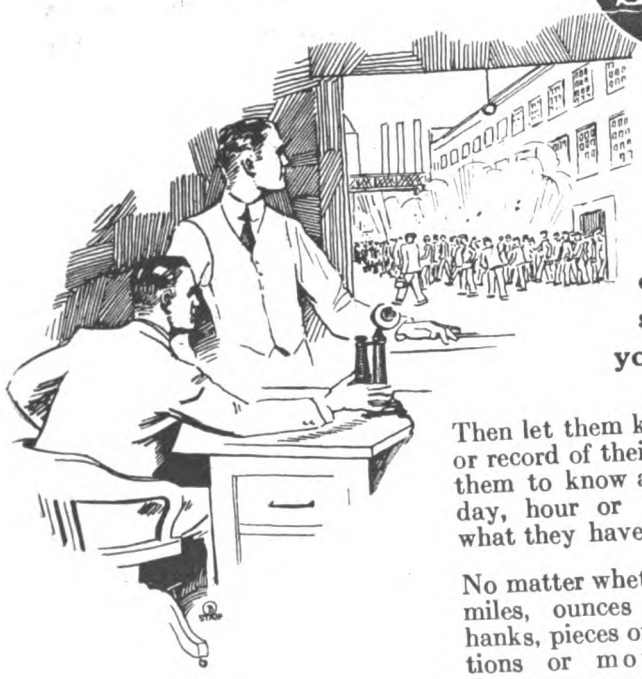
RAPID PRODUCTION LATHES
WHITCOMB PLANERS
SPECIAL MACHINERY

WORCESTER, MASS.
677 CAMBRIDGE ST.,
Branch Offices and Agents Throughout the World



THE SOLUTION

Do You Want To Avoid Strikes ?



or misunderstanding with your employes?

Then let them keep accurate count or record of their own work—allow them to know at the end of each day, hour or operation—exactly what they have done.

No matter whether this is inches or miles, ounces or tons, picks or hanks, pieces or individuals, operations or movements—*Root Counters can give an accurate and verified record of it.*

Why not allow our Engineers to come to your plant, at no cost to you and see what they can save by suggestions.

ROOT
BRISTOL, CONN.

Production *Plus*

(*Continued from page 13*)

Leaving the cylinder block machining group we next come to the tractor piston machining unit. Here, in Fig. 12, we note that the machines are driven in groups, the countershafts and jack-shafts being suspended on steel skeleton structures. The ability of a piston to roll easily has been availed of by the Ford engineers in handling their transportation, for they roll from one machine to another on simple tracks composed of parallel pairs of angle irons.

From this point to the northern end of the shop is space as yet largely unfilled and reserved for additional machining units. Eventually all of the Ford cast iron machining will be cared for at River Rouge. Some of it, made at the Highland Park foundry (which will also be abandoned shortly) is now machined at Highland Park. The car cylinder head job is now being transferred and the machine unit at River Rouge is nearly ready to take over this work.

Following the finished stock conveyor through the opening in the northern wall of the building, we come to its terminus in a shipping platform. As shown in Fig. 13, this is provided with roller conveyors for ease in loading the freight cars which are spotted against the doors at either side of the loading platform.

The large and medium size machine tools at River Rouge are driven by individual motors which are either geared or belted directly to the tools. As a result the space above the machines is free from belts. Being thus unobstructed it can be utilized for work handling equipment. Fig. 14 gives a good illustration of this. It shows the second milling operation on the Ford cylinder blocks and it also shows how completely utilized is every available foot of floor space. The "business end" of this same operation is shown in the next picture, Fig. 15. Twelve cuts are being taken at one time on the cylinder tops and sides. Work of this sort naturally calls for frequent cutter replacement and brings up the subject of cutter grinding. This is decentralized because of the size of the plant and cutter grinders are located in the various machine units. Auxiliary tool repair departments and tool issue rooms are also to be found at convenient locations, although the making of these cutters is centralized in the main tool room in the B building.

Tool set-up on the various machines is not cared for by the machine operators, but by special set-up men each of whom is responsible for a certain operation or a number of machines. Sometimes the set-up man is really the foreman or sub-foreman. This varies according to the nature of the work and its needs. Machine repair is performed by traveling repair gangs operating under the jurisdiction of the tool room superintendent, and that are sent from one place to another as required. Lubrication is also a function which comes under tool room jurisdiction, the philosophy back of this being that the greater proportion of breakdowns in the average plant is due to lack of oil. This is avoided at River Rouge by systematic and regular oiling. The larger machines are all equipped with multiple oil feed systems having conductor pipes leading to the principal bearings. Tool coolant consists of an oil emulsion which is pumped through the plant and delivered to each machine.

In a plant where the production is on such a huge basis the disposal of chips becomes a problem in itself. Wherever possible this is cared for by automatic transportation as in the case of the battery of cylinder boring machines shown in Fig. 16. Here we see that underneath the stock-carrying conveyor is a belt conveyor for handling chips mounted on the same frame as the stock conveyor and thus requiring no additional floor space. At the left in this same picture are to be seen tote boxes used for handling chips in bulk and which are picked up by the overhead traveling crane.

A good idea of the closeness

(*Continued on page 39*)

Digitized by Google

PROCRASTINATION

will only increase your losses under the Workmen's Compensation Act

Install

Golden-Anderson

Double Extra Heavy Valves



before that boiler tube bursts. Why procrastinate and gamble on the lives of your men in the boiler room? In the steel industry, they are safeguarding hundreds of lives daily by standardizing on

Golden-Anderson Automatic Double-Cushioned Triple-Acting and Non-Return Valves—

Why? Here is the answer. They

1. Automatically cut out a boiler the instant that a tube ruptures or other internal break occurs.
2. Automatically cut off the steam flow from every boiler the instant that a steam pipe bursts.
3. Automatically equalize the pressure between all boilers.
4. Automatically cut in a boiler making accidents due to inaccurate steam gauge impossible.
5. Positively prevent back flow of steam into a cold boiler.
6. Can be closed by hand, like ordinary stop valve, and arranged with "combination feature" to open valve like regular gate or globe valve.
7. Can be tested in service from the boiler room floor.
8. Double Corliss Dash Pot that cushions in opening and closing.
9. Cannot pound, spin, stick or chatter.

Over 4100 used in the large steel companies

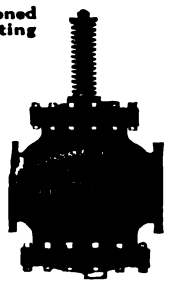


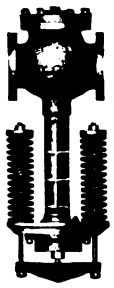
GOLDEN-ANDERSON
Pat. Cushioned Water Relief Valves

1. Automatically relieve excess pressure.
2. Prevent stress, strain and bursting of mains.
3. Correct mechanical construction.
4. Perfect air and water cushioning.
5. No metal-to-metal seats. No hammering or shocks.
6. Angle and globe pattern. Sizes 3 to 30 in.

GOLDEN-ANDERSON
Pat. Automatic Cushioned Water Pressure Regulating Valves

1. Maintain a constant reduced pressure regardless of fluctuations on high pressure side.
2. Perfectly Cushioned by water and air. No metal-to-metal seats.
3. The best valve made for maintaining a constant low pressure where consumption is continuous.
4. Operates quickly or slowly as required—No attention necessary.
5. Positively no hammering or sticking. Sizes to 24 in.



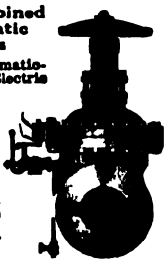


GOLDEN-ANDERSON
Pat. Automatic Cushioned Steam Pressure Reducing Valves

1. Maintain a constant reduced pressure.
2. Thoroughly cushioned.
3. No hammering, chattering or sticking.
4. No auxiliary valves or small by-passes to clog up.
5. No wire drawing.
6. Only one adjustment from the outside.
7. Double extra heavy throughout—practically indestructible.

GOLDEN-ANDERSON
Pat. Cushioned Combined Throttle and Automatic Engine Stop Valves

1. Operate 2 ways: Automatically, by Hand, or by Electric Switch.
2. Prevent Fly-wheel Explosions.
3. "Double Corliss" Cushioned—No Pounding or Sticking.
4. Contains No Tight Fitting Parts.
5. Furnished in Angle and Globe Patterns for High or Low Pressures.
6. "Always Ready for Service."



GOLDEN-ANDERSON
Pat. Automatic Double Cushioned Check Valves

1. Especially adapted for Water Service.
2. For High or Low Pressure.
3. Thoroughly Cushioned. No chattering, Hammering, or sticking.
4. Globe or Angle Patterns up to 30 in.
5. Especially adapted for hydraulic elevator service.



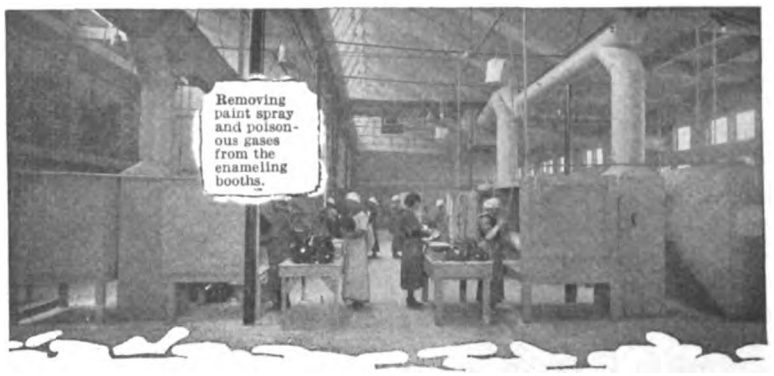
GOLDEN-ANDERSON
Pat. Cushioned Automatic Controlling Altitude Valves

1. Automatically Maintain uniform Water Levels in Tanks, Standpipes, Reservoirs, etc.
2. For High or Low Pressure. Always Dependable. 3. No Floats or Fixtures used. 4. No Water Hammer or Shocks. 5. Sizes up to 30 in.



Golden-Anderson Valve Specialty Co.

1306 Fulton Building **Pittsburgh, Pa.**



Benjamin Electric knows the value of putting moving air to work—

AT the Benjamin Electric plant at Desplaines, Illinois, moving air, supplied by Clarage-Kalamzoo Fans Blowers and Exhausters is serving in some mighty profitable applications.

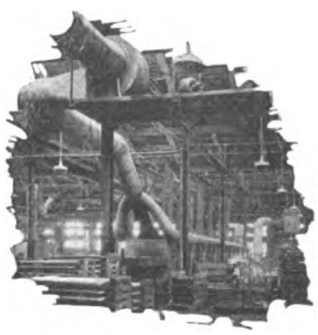
Five installations have been made since 1918. As shown in the illustrations, fans, blowers and exhausters are used to exhaust spray and gases from the enameling booths, to distribute cool air in front of the baking ovens, to draw waste heat from the furnace stacks and carry it to the drying room, to carry heated air from the drying room to the pickling room and to supply heated air for a continuous dryer and for heating.

This same industrial force-moving air—will cut your operating costs, too. Supplied by Clarage-Kalamazoo equipment it is conveying light materials through pipes cheaply, is exhausting dust, dirt, and gases, is preventing condensation, is cutting the cost of drying, is supplying mechanical draft, is removing waste heat from kilns and ovens and diverting it to heating systems and is serving in a hundred and one miscellaneous ways.

Investigate—know the profit-making possibilities of moving air.



Here Clarage-Kalamazoo Fans distribute cool air to the men working in front of the drying ovens.



This system sends waste heat from the stacks to the drying ovens, then to the pickling room, then to the heating system. Costs are sharply cut.



Another view of exhausters that are used to draw paint spray and gases from enameling booths.

Want this booklet?

This booklet gives briefly some of the ways in which fan equipment is cutting operating costs, is speeding production and is making working conditions better. There's a copy for you; just tell us where to mail it.

Clarage Fan Co., Kalamazoo, Michigan

New York City	Memphis
Minneapolis	Philadelphia
Cleveland	Chicago
Pittsburgh	Indianapolis
Detroit	Rochester, N. Y.
Los Angeles	

New England Elec. Equip. Co., Boston

Complete stocks carried in New York, Pittsburgh and Memphis

CLARAGE-KALAMAZOO Multiblade Fans



Digitized by Google



Old Man Rust cannot eat metal parts cleaned with International Compound No. 22 at 6c per pound

ONE of the troubles I run into most frequently is the rusting of screw machine products which are stocked for any length of time.

Recently I was called in by a large concern which was having a great deal of trouble with rusting. As the pieces came from the machines covered with lard and machine oil, they were very carefully cleaned and then dipped into oil to prevent rusting. In spite of all the care they exercised rust always appeared under the oil after the parts had been stocked for awhile. This of course was due to something which had been left on the metal through improper cleaning.

Four ounces to the gallon of our INTERNATIONAL COMPOUND No. 22 at 6c per pound cleaned the parts beautifully. Old Man Rust just couldn't touch them.

This cleaner leaves a white coating on the metal which is a Jim Dandy rust preventer. It combines readily with any oil which may be used later on as a permanent rust preventer.

Here's a real cleaner that prevents rust and its cost is only 1½ cents a gallon. Let me send you a barrel of INTERNATIONAL COMPOUND No. 22. Use it; check up costs and results and if the No. 22 don't beat your present cleaner forty ways send it back and you don't owe us a cent. Let's hear from you folks who are willing to be shown.

Internationally yours
John Bright

International Products
I.C.C.
International Chemical Co

INTERNATIONAL CHEMICAL CO.
PHILADELPHIA ~~~~~ PENNA.

Digitized by Google



Uses 25% less ice

This square cooler uses 25% less ice

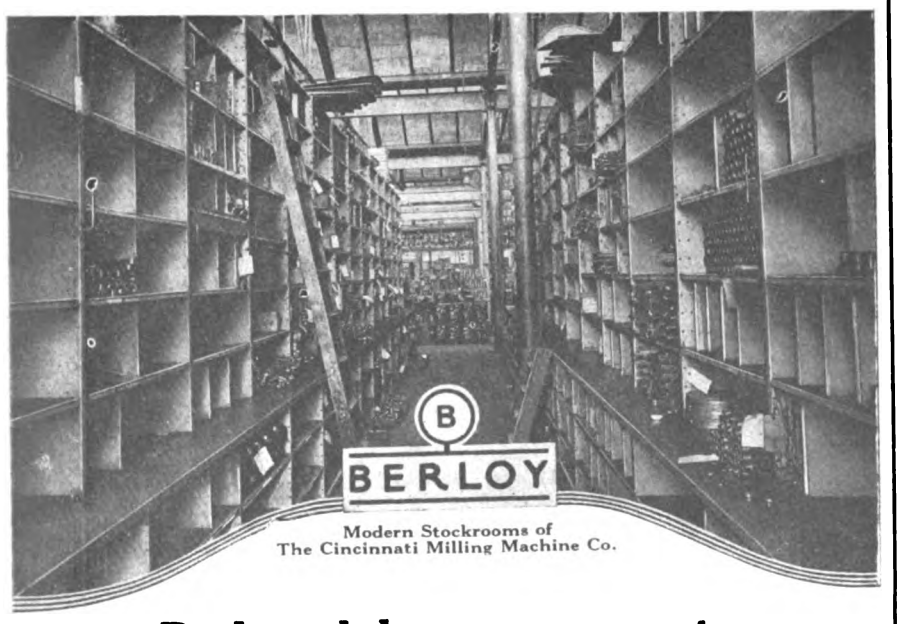
ANY manufacturer using Jewett *Square* Water Coolers will gladly verify this statement. But the fact that by being square they take ice in a cake and eliminate the need for cracking it into small pieces, makes this obvious. Then, too, as it takes time to crack ice, they also save in labor—so that in the installation of Jewetts you really perform a double economy.

Jewett *Square* Water Coolers installed in connection with the regular water system hygienically provide an ample supply of refreshing, cooled drinking water that offsets the energy-sapping effect of hot weather by keeping your workers refreshed and invigorated.

Literature covering the economy of Jewett *square* design in detail—as well as the convenient, sanitary angle-flow bubbler and many other advantages will gladly be mailed, together with prices, upon request.

The Jewett Refrigerator Co.,
Established 1849
36 Chandler St., Buffalo, N. Y.

JEWETT
SQUARE WATER COOLER
Uses 25% less ice



Modern Stockrooms of
The Cincinnati Milling Machine Co.

Reduce labor—save waste

Our steel stock bins provide the right sized space for each stock item—they are quickly adjusted to fit changing requirements. At no time need there be wasted space. Stocks are kept better, are easier to locate and require fewer employees to handle. Write for our illustrated catalog No. 50 which shows some of our installations for prominent concerns. We helped them get better results at lower cost and we can help you.

The Berger Manufacturing Co., Canton, O.

BRANCHES: Boston New York Philadelphia Chicago
St. Louis Kansas City Minneapolis San Francisco
Export Dept.: Berger Bldg., New York City, U. S. A.

Berloy Steel Storage Bins

(*Continued from page 36*)

of machine placing is given by Fig. 17 which shows the face milling of the ends of the Ford car cylinders. In the center of this picture is the gravity roller conveyor which brings the work to these machines. An ingenious method of doubling production is shown in the utilization of a two-story work table in this and the succeeding illustration. The lower tier of cylinders is held in place by clamping screws which extend through the top table while the top row is held by clamp bolts located in the two end cylinder holes. Special nuts and wrenches are provided to facilitate the quick clamping of these cylinders.

By far the greater proportion of machine tools used at River Rouge, as at Highland Park, are standard production tools. Where special equipment is required as in the cases of the line reaming machine in Fig. 19, the multi-spindle drills in Fig. 20, and the camshaft hole boring lathes in Fig. 21, the tools are usually designed by the Ford engineers and built by various machine tool manufacturers to the Ford specifications. For some operations, however, it seems impossible to get away from the good old-fashioned engine lathe, as in turning and facing the transmission flange of the car cylinders, shown in Fig. 22. Notice in this illustration the very convenient location of the emery wheel which is used for tool dressing, and which is just back of the operator.

Many thousands of pounds of babbitt must be melted daily to take care of babbitting some fifteen thousand bearings each twenty-four hours. Thus the department shown in Fig. 23 is an extremely busy one. One of the babbitting jigs is shown open in the foreground at the right and another one closed and ready to pour with the cylinder in place is to be seen in the central background. After each cylinder has been poured it is slid up the sheet iron incline to the conveyor shown at the left which carries it around a loop and back past the high speed gate trimming machines shown at the left. The castings pass through these machines exactly as wooden blocks pass through a buzz planer and the surplus

(*Continued on page 41*)

A New Vision in Development Work

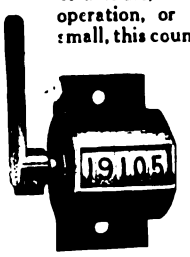
The inventor, patiently watching the performance of a new machine, tries one expedient after another for bettering its rate of production.

Every noticeable gain registers on his mind—but more surely and precisely will it register on a *Veeder Counter.*

If you wish to know the slightest variation in the output; if you want an accurate indication of how each development affects *results,* then attach a

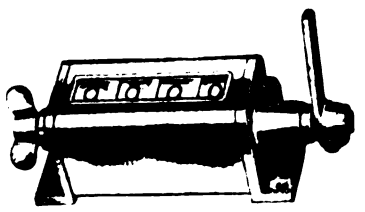
Veeder COUNTER

The small Revolution Counter below registers one for a revolution of a shaft, recording a machine operation, or product. Though small, this counter is very durable; its mechanism will stand a very high rate of speed, making it especially suitable for light, fast-running machines, and most adaptable to experimental work.



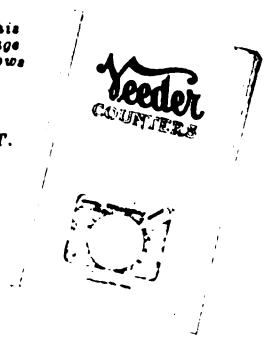
If run backward the counter subtracts. Price $2.00. (*Cut 3/5 size.*) Small Rotary Ratchet Counter, to register reciprocating movements of small machines, also $2.00

The Revolution Set-Back Counter below records the output of any machine where a shaft-revolution indicates an operation.



Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price, with four figure-wheels, as illustrated, $10.00—subject to discount. *Cut less than one-half size.* Set-Back Rotary Ratchet Counter, to record reciprocating movements as on punch presses, $11.50 (list).

FREE—This new 80-page booklet shows everything you could ask in a counter. Ask for IT.



The Veeder Mfg. Co.
63 Sargeant St., Hartford, Conn.

Digitized by Google



PRESSED STEEL CAR COMPANY
PITTSBURGH, PA.
BUILDERS OF FREIGHT AND PASSENGER CARS
OFFICES AT NEW YORK, PITTSBURGH AND CHICAGO

McKees Rocks, Pa., February 23, 1923.

The Bonnot Company,
Canton, Ohio.

Gentlemen:-

With reference to the pulverized coal system which you installed for this company at its McKees Rocks plant some years ago:

Would say that the installation is successful in operation and has been a very large saving to us in the cost of fuels for furnace heating, annealing of malleable castings in our foundry, etc., and we consider the system a decided success.

Yours very truly,
General Manager.

C.M./s

Proved by Years of Service

"a decided success"

The Pressed Steel Car Company, McKees Rocks; Pennsylvania, builders of freight and passenger cars, unqualifiedly endorse Holbeck Pulverized Coal Systems after more than five years use.

Economical in operation, satisfactory in performing heating operations, effective in control, it "has been a very large saving in the costs of fuels."

These results can be secured in your plant.

PULVERIZED COAL EQUIPMENT

Write for Bulletin No. 600

The Bonnot Company, Canton, Ohio

Sole Licensees for Holbeck Systems in the United States

Digitized by Google

STEEL GRIP



Hand Insurance Means More Production

Insure against torn, bruised hands with Steel-Grip Industrial Gloves. They give the men added assurance of safety, and aid the management in eliminating lost time due to painful injuries.

Thin gloves and make-shift substitutes often do more harm than good.

Men who handle castings and other rough materials in shops, foundries, mills, scrap yards, mines or smelters require gloves especially made for the job.

STEEL-GRIP INDUSTRIAL GLOVES

are *built up* of three wearing surfaces and a comfortable felt lining—flexible steel ribbon reinforcement clinched over tough strips of leather and strong steel thread stitching. No danger of seams ripping, burning or tearing out.

There's a Steel-Grip glove to meet every industrial requirement.

Catalog sent on request.

INDUSTRIAL GLOVES CORP.
2647 Maplewood Ave., Chicago.

Try a dozen Pairs



(*Continued from page 39*)

babbitt and fins are removed from the bearings by means of a high speed milling cutter mounted on a horizontal arbor.

Leaving the trimming machines the cylinders pass, via conveyor, a peening operation shown in Fig. 24. Here the babbitt is compacted by special corrugated hammer heads operated by air.

Among the final machining operations on the Ford motor cylinder blocks is that of finishing the cylinder bore. This is rolled to size instead of being reamed or ground, a practice which originated at the Ford plants. The tool used for this rolling or swaging operation is shown in Fig. 26. It consists of a tool head in which are mounted hardened and ground rollers, held to exact diameter and free to rotate. In passing these tools through the cylinder bore the diameter is increased approximately 1/1000 of an inch and the metal, besides being compacted, obtains an exceedingly smooth finish.

After the machining operations are completed the cylinders pass through a washing machine shown in Fig. 27, where the oil and grease which may have been accumulated by them during the machining operations is removed. The final operations on the cylinder blocks are shown in Fig. 28. The operator at the left is blowing out the port cavities by means of a compressed air device. The remaining men shown in this picture are inspectors who are checking up the various machined dimensions. This inspection takes place on one side of a loop conveyor and on the move. At the end of this conveyor are situated the hydraulic testing machines previously shown in Fig. 11. All cylinders which satisfactorily stand up under this final water test are marked O. K. and are slid out upon the finished stock conveyors to begin their journey to the shipping platform.

The remaining pictures presented with this article have to do with tractor piston maching. These operations have been selected as representing Ford machining practice applied to small castings as contrasted to the heavier work represented by tractor and car cylinders.

DODGE

Material Handling Equipment



This Dodge conveyer helped build the Mitchell Dam at Verbena, Alabama

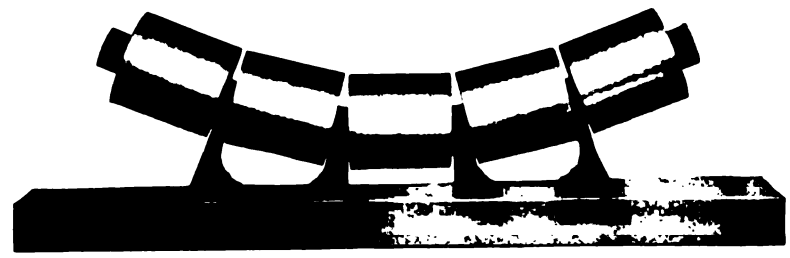
THE 30 inch belt conveyors shown above run from the recrushers to the storage pile and handle 2 inch rock continuously at the rate of 100 tons per hour.

Another conveyor using a 36 inch belt handles 6 to 8 inch rock from sledging crusher to recrusher house at the rate of 200 tons per hour.

Dodge conveying equipment embodies the qualities of sturdiness and fitness for the job which assures steady uninterrupted handling of materials at minimum expense for repair and upkeep.

Our engineering department is qualified by long experience to recommend the right installation to most economically serve your specific purpose.

Write for full particulars about the standardized Dodge line of conveying and elevating equipment.



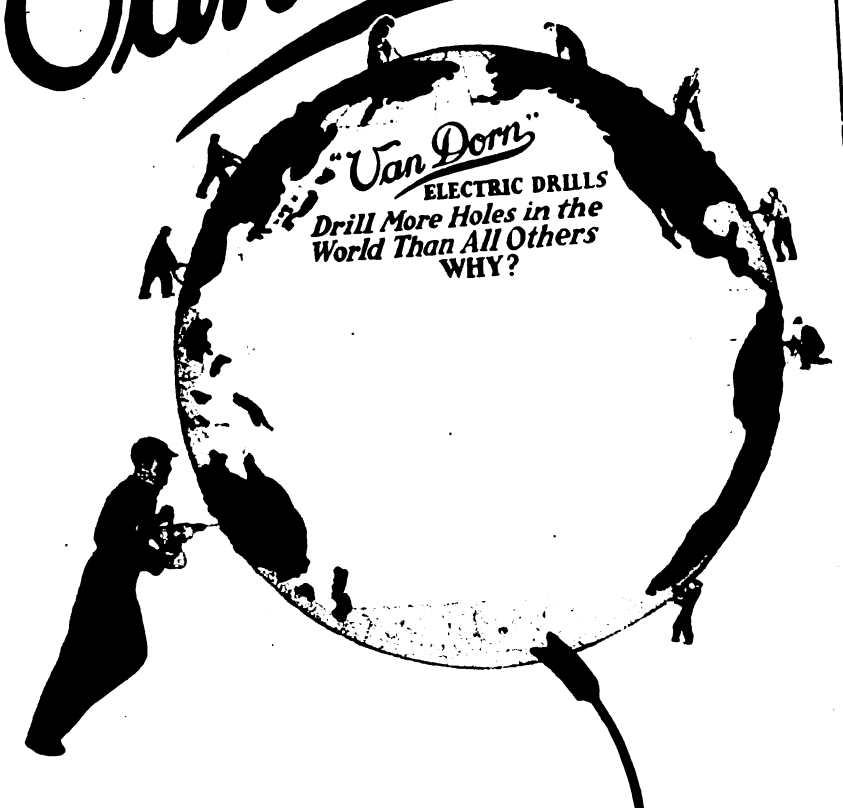
Dodge Manufacturing Corporation

General Offices: Mishawaka, Indiana. Works: Mishawaka, Indiana, and Oneida, N. Y.
Dodge Manufacturing Company of Canada, Ltd., Toronto and Montreal

New York, Boston, Philadelphia, Pittsburgh, Atlanta, Cincinnati, Minneapolis, Houston, Seattle, St. Louis, Chicago, San Francisco

Digitized by Google

"Van Dorn"



Why Experiment?
Use
"Van Dorn"
ELECTRIC DRILLS and GRINDERS

They are invariably selected for the real "He-Man" drilling jobs.

If you need a drill that will drill, or a grinder that will grind continuously—

Let us send you our catalog.

The Van Dorn Electric Tool Co.
Cleveland, Ohio

What Cooper Union Means in the Engineering World

(Continued from page 30)

processes; John P. Leo, chairman of the Board of Standards and Appeals, Greater New York; Frederick T. Crane, City Engineer, Orange, N. J.; Charles F. Giraud, civil engineer New York Central and Hudson River R. R.; Adolph G. Koenig, engineering contractor power plants, and many another man of like importance. You will find Cooper Union engineers in all the important departments of Greater New York; in Government ordnance works; in Edison and other electrical plants; professors of engineering in many universities, from E. J. Kunze, of the Pennsylvania State College, to Robert M. Storme, at Tientsin, China, a long way from the old brown structure in Cooper Square.

The very fact that Cooper Union pupils work at some vocation while pursuing their studies, accounts for the earnest type of students to be found in its classrooms and the prominence which its graduates attain in the three branches of engineering taught. Then, too, the practical application, during the day, of theories learned at night, makes the engineering course at Cooper Union peculiarly intensive.

The part that Cooper Union plays in the engineering world of this country may not be over-estimated. It is, therefore, a noteworthy fact that this branch of its activities recently formed an organization known as the Cooper Union Branch of the American Society of Mechanical Engineers, which supplies that connecting link between the embryo and professional engineer by means of which the student is put in touch with the practical operations of his profession and given opportunity to see and hear the achievements of the greatest engineers this country affords.

Mr. Calvin W. Rice, Secretary of the American Society of Mechanical Engineers, and other distinguished members of the profession, went to the students' meeting at Cooper Union to welcome the new body into professional folds and uttered the highest encomiums upon the number and enthusiasm of the students and the manner in which they conducted and presided over the meeting. Officers of this new organization in the engineering life of New York, are: Harold W. Merritt, chairman; Samuel Wilnin, vice-chairman; Goodman J. Harris, Secretary, and Israel H. Marantz, treasurer.

Membership in this student branch is limited to men in the last two years of the mechanical engineering course, and the fact that day-school men average twenty, and night-school, twenty-three years in age, created a peculiar condition and made it necessary to satisfy the requirements arising from such a state.

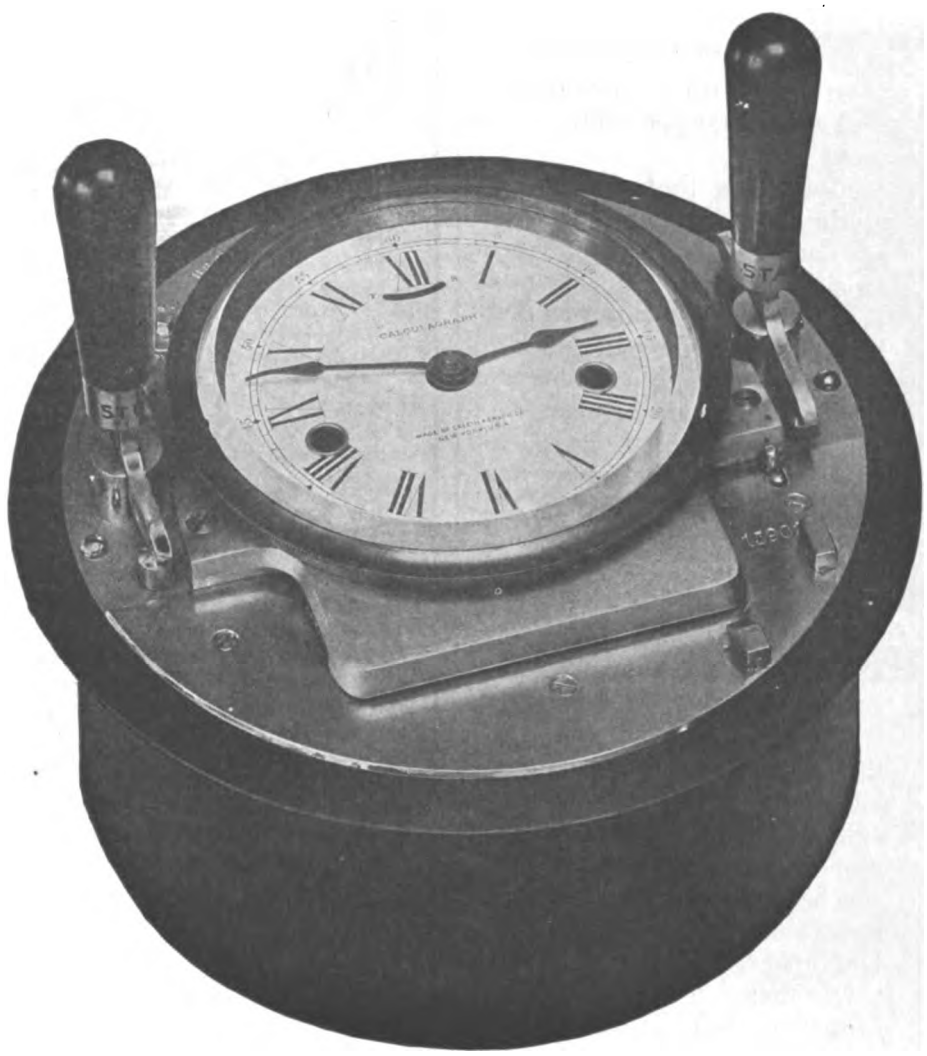
There are only about four such engineering schools in the United States, with not sufficient similarity in their day and night classes for complete education in engineering to afford a precedent, and the society of professional engineers suggested that the Cooper Union student body model its organization according to requirements, since the parent society is liberal as to the form of constitution they draw up.

Cooper Union is, perhaps, the most efficient "melting pot" New York owns in its process of Americanizing foreign born citizens. Numbers of its earnest and gifted students cannot speak a word of our language. Therefore, members of the newly-formed engineering organization include some foreign-born and some of foreign parentage although a majority of the sixty-five students enrolled are Americans.

Of their own initiative these embryo engineers applied to the American Society of Mechanical Engineers for authorization in the forming of a student branch. When this was granted, Professor George F. Bateman, of the Engineering Department of Cooper Union and himself a graduate of that institution, assisted the young men to form a committee and after a constitution had

(Continued on page 44)

Digitized by Google



Can you afford a yearly production loss of $2,250?

If you have 100 men in your shop averaging 30c an hour, and each of them computes his own time for every job, you will find that it takes each one about 15 minutes a day to calculate the elapsed time.

Fifteen minutes is not much. But, if you will stop to figure the total cost to you over a period of one year, you will find that you are losing $2,250.

Can you afford it?

The Calculagraph eliminates this loss—turns the wasted minutes into productive time. But besides that, the Calculagraph gives you an accurate printed record of the starting, finishing and ***elapsed time.***

Two pulls of the handles and the ***elapsed time*** is stamped right on the job ticket—the record is complete.

If you haven't seen our booklet "Elapsed Time Records," write for it today.

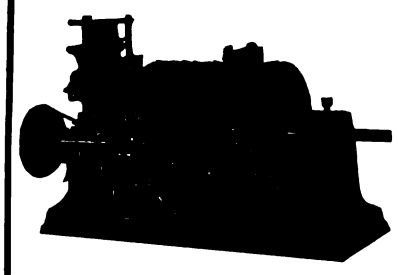
THE CALCULAGRAPH

THE ELAPSED TIME RECORDER

34 Church Street, New York City

Digitized by Google

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway New York

(Continued from page 42)

been drawn up it was adopted and given 100 per cent. enrollment.

Few know that students of engineering who are accepted in student bodies of professional engineering societies must qualify for this privilege by possessing high-school training, or its equivalent; and must be members of classes in engineering which have already given them a four years' course in that science and which would lead to an engineer's degree.

Cooper Institute teaches the main branches of engineering, and the four principal organizations which represent such training, professionally, are the American Institute of Electrical Engineers, American Institute of Mining Engineers, American Society of Mechanical Engineers, and American Society of Civil Engineers.

Of these four engineering branches, mining is omitted from the curriculum of Cooper Union, although a student's course in other forms of engineering, geology, chemistry and metallurgy form an excellent foundation for future studies along the line of mining endeavors.

It becomes evident that while a student of engineering receives, in his classes, a knowledge of those fundamentals necessary to the practice of his profession, he is out of contact with engineering professionally. This want the student branch of professional organizations supplies. Parent engineering societies care for the professional engineer; student branches of these societies provide for the professional engineer in embryo, before he graduates, and make the change from classroom to the practical application of its precepts less marked after the student obtains his degree.

One advantage possessed by student branches is that parent organizations furnish their very best men to speak to students. These, in turn, have an opportunity to deliver addresses on what they have learned, and, while imparting knowledge to others and increasing their own, become versed in the art of public speaking, acquire poise and [illegible]. They also

healthful working conditions.

A complete unit in itself. Requires no expensive installation equipment; operates directly from electric light socket. Weighs only 6 pounds and may be carried and used anywhere. No condensation as with compressed air.

A practical, economical blower of *proved* value. In daily use by leaders in every industry.

Write for descriptive folder giving prices, testimonials by leading manufacturers, etc.

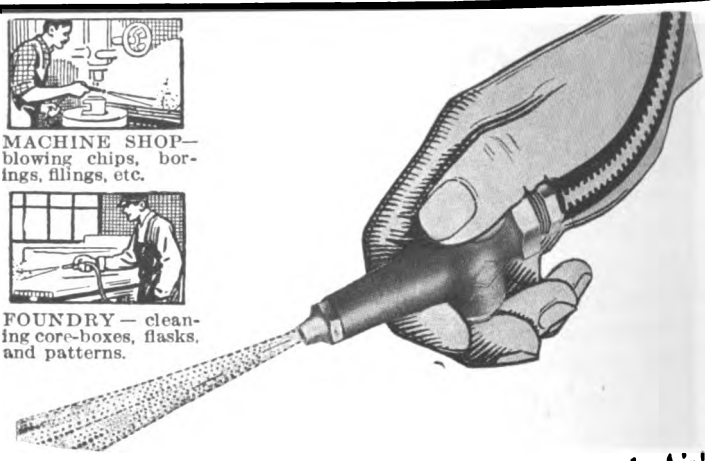
Clements Mfg. Co.
612 Fulton St.
Chicago



Blowing out the Dust which Causes Unnecessary Friction in Line Shafting

MACHINE SHOP—blowing chips, borings, filings, etc.

FOUNDRY — cleaning core-boxes, flasks, and patterns.





TEXTILE MILLS—blowing lint, dust, and dirt from machines.



ELECTRICAL STATIONS—cleaning armatures, field coils, boards, and controllers.

Users of Compressed Air!

A waste-proof air gun for cleaning

Fitted with a Jenkins Renewable Disc specially made for air, Jenkins Air Gun holds tight when closed and stops air waste.

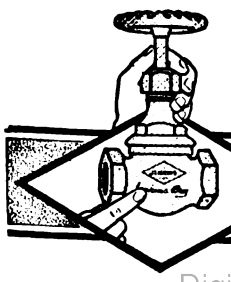
A press of button gives full blast.

Made of bronze to Jenkins high standard.

30 DAYS' TRIAL

Send for a Jenkins' ¼" Air Gun for 30 days' trial. No obligation on your part.

JENKINS BROS.
80 White St., New York, N. Y.



Always marked with the "Diamond"

SINCE 1864

Digitized by Google

Is Accurate Temperature Regulation Vital to Your Product?



A single batch of iled material, or a gle process gone ong because of crude nperature regula- n methods, often ts much more than installation of a endable, accurate nperature regulator.

The Sarco Tem- rature Regulator— cause of its simplic- , its absolute cer- nty of temperature ulation, and its re- rkable adaptability various mechanical units—serves y in and day out, always main- ning a dogged grip on the cor- t temperature, within the range deg. F. and 300 deg. F.

Operated by the sure expansion d contraction of an extremely nsitive liquid, Sarco Regulators e instantly responsive to the ghtest fluctuations in tempera- re. No electrical, compressed , water, or other outside attach- ents required for its operation. is entirely self-contained and f-operating.

A Sarco operates on gas, steam hot water heat. Can be sup- ed to control temperature in ost any kind of manufacturing ocess—including the most deli- e. Also controls room tempera- e.

Write us about your particular oblems of temperature control d our engineers will be glad to ake recommendations for obtain- g a better product, an increase production or lowering manu- cturing costs.

Sarco Regulators are sent on 30 ys' free trial to prove their aptability. If not satisfactory e regulator may be returned and e trial costs you nothing. Book- R-73 contains interesting infor- ation. Write for it.

ARCO CO., Inc.

6 Broadway, New York City

Buffalo Chicago Cleveland
Detroit Philadelphia

acock Bros., Limited
Montreal

SARCO TEMPERATURE REGULATOR

may, after listening to addresses by great engineers in the parent societies, make resumés of these papers for the benefit of fellow students. Since student branches meet frequently, their opportunities for receiving and disseminating knowledge are considerable.

Cooper Union gives sound instruction in the fundamentals of engineering and a three months' vacation to students, who need no urging to adopt the suggestion that they take up work in line with their profession—since work they must —and recount their experiences and observations during vacation to their fellows.

The students' branch provides for visits to various engineering points of interest, and on such occasions students are left to develop their own initiative. Some member of the faculty sits on the Governing Board of student branches, but merely to act as advisor in case problems arise that require his aid. On their visits to engineering plants, students are without instructors, except as guests. All the instruction given is furnished by a guide at the point visited.

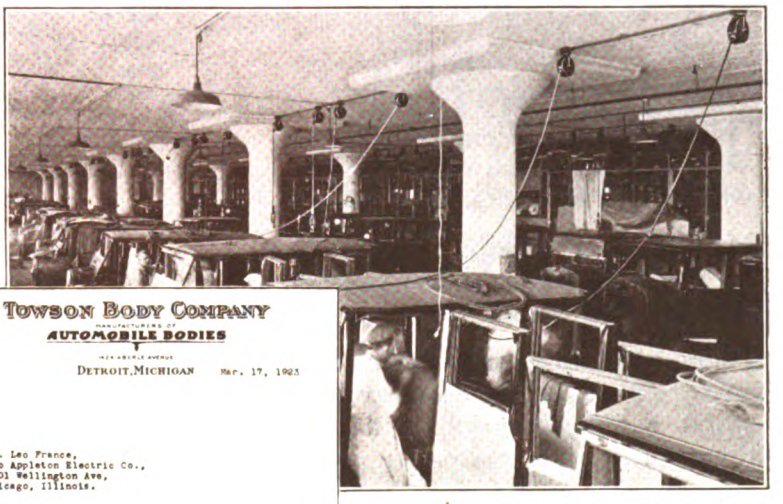
From its inception the Cooper Union Students' Branch of the American Society of Mechanical Engineers, decided that theirs should be a professional, not a social organization. They know that their work will be criticized by experienced engineers and that they must reply to this criticism by explaining the principle on which they had worked out the problem presented. They realize to the full, what it means to their professional future to have the benefit of such criticism and coöperation in their student days.

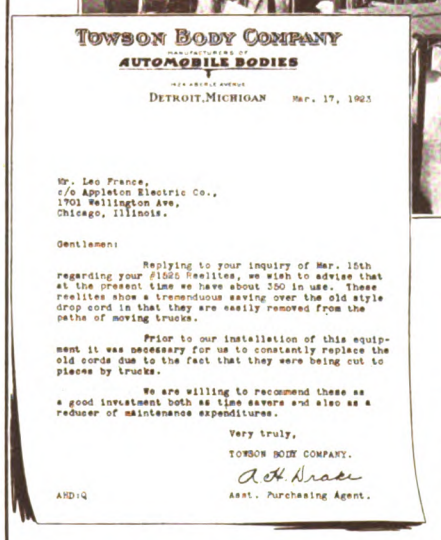
Not only have they adopted the watchword—"Service"—of the American Society of Mechanical Engineers, but they speak of and act on it in their society and seek to convey in their actions how thoroughly hey intend to apply this motto: "Service to others is the expression of the highest motive to which men can respond, and duty to contribute to the public welfare demands the best efforts that men can put forth."



Reelite

REG. U.S. PAT. OFF.





TOWSON BODY COMPANY
MANUFACTURERS OF
AUTOMOBILE BODIES

DETROIT, MICHIGAN Mar. 17, 1923

Mr. Leo France,
c/o Appleton Electric Co.,
1701 Wellington Ave,
Chicago, Illinois.

Gentlemen:

Replying to your inquiry of Mar. 15th regarding your #1525 Reelites, we wish to advise that at the present time we have about 350 in use. These reelites show a tremendous saving over the old style drop cord in that they are easily removed from the paths of moving trucks.

Prior to our installation of this equipment it was necessary for us to constantly replace the old cords due to the fact that they were being cut to pieces by trucks.

We are willing to recommend these as a good investment both as time savers and also as a reducer of maintenance expenditures.

Very truly,
TOWSON BODY COMPANY.
A. H. Brace
Asst. Purchasing Agent.

AHD:Q

Cutting the Cost of Cord Maintenance

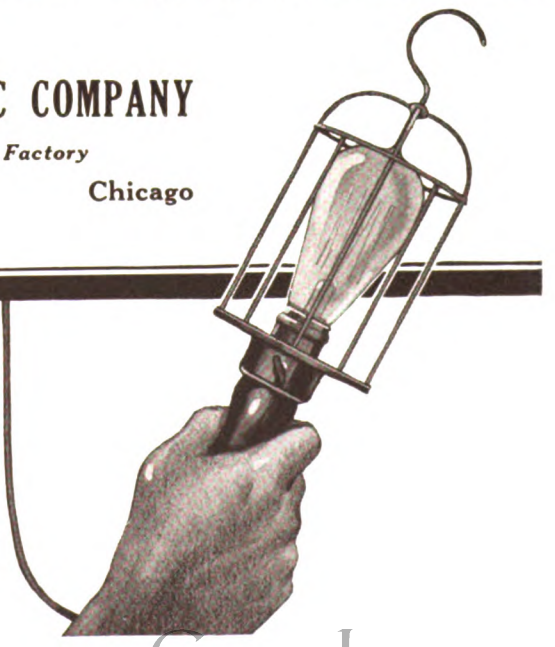
Three hundred and fifty Reelites save many dollars every day for the Towson Body Company. Their automatic reels which hold and automatically retrieve twenty-five feet of heavy super-service cord, (window shade action) allows the workmen to place illumination just where it is needed, without having tangled, dangerous, unsightly cords drooped over the bodies and under the wheels of trucks. Further, the cord is kept clean and does not soil the upholstery. These Reelites "show a tremendous saving over the old style drop cords in that they are easily removed from the paths of trucks." They are built of steel like Appleton Unilets and last for years, speeding production and reducing maintenance. Reelites are furnished in several sizes, handling cords from 10 to 125 feet. Write us your illumination or portable tool problem—we will gladly give you the Reelite solution.

APPLETON ELECTRIC COMPANY

General Offices and Factory

1716 Wellington Avenue Chicago

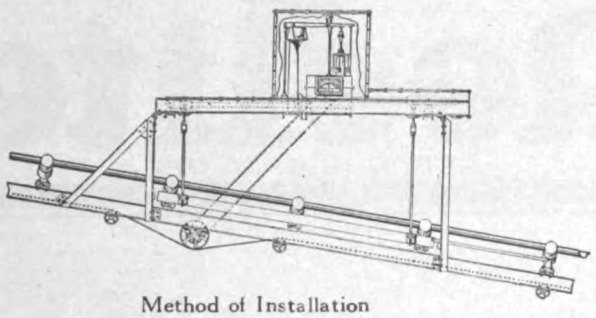
Folder 314S suggests several profitable users for Reelites in your plant, and will be sent without charge when requested.



Digitized by Google

If Conveyors Handle your materials

You Need the MERRICK CONVEYOR WEIGHTOMETER



Method of Installation

THE Merrick Weightometer provides an accurate means of checking conveyor handled material while these products are in transit.

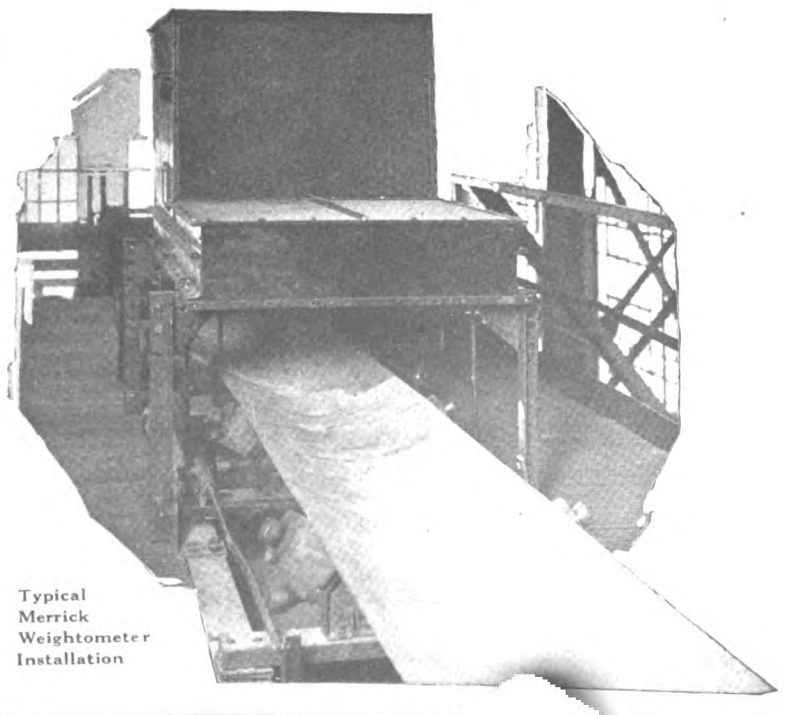
No additional handling is necessary—no added costs in time and labor—no weighman or attendant is needed. And the accuracy is guaranteed 99 %.

It gives reliable weights on all materials bought and sold. It is adaptable to the weighing of coal, gravel, stone, cement, phosphate, fertilizer, fish, ores and many other bulk materials.

Reliance on Bill of Lading weights is far from dependable.

Let us explain to you the advantages of the Merrick Weightometer. Write for the "Merrick Circulars." They will show you a way to added profits that you have probably overlooked. ***Send in for them Now.***

MERRICK SCALE MFG., CO.,
180 Autumn St. Passaic, N. J.



Typical Merrick Weightometer Installation

Promotion Team Work Through Athletics

(*Continued from page 21*)

baker plants was 23.7 per cent., while the average for other factories in Detroit in the same month was 26.4 per cent. The corresponding month of 1921—in the midst of the business depression—showed the Studebaker turnover to be 3.3 per cent. and the average for the city to be 12.1 per cent., while May of 1922 shows a turnover of 10.8 per cent. in the Studebaker organization as compared with a city average of 19.2 per cent.

Making the same comparison for the month of June of each of these three years we find that the Studebaker turnover in 1920 was 23 per cent. and that of the city was 25.9 per cent.; in 1921 it was 4.2 per cent. in the Studebaker plants and 14.7 per cent. in other factories throughout the city; and in 1922 it was 15.9 per cent. for Studebaker as compared with 21.5 per cent. for the city average.

The "Length of Service Report," reproduced herewith, gives another view of the subject. Reading from top to bottom, the lines represent respectively, the total working force, the number who have been in the service more than one year, and so on for two, three, four, and five years. This merely affords another illustration of the fact that employees of the Studebaker Corporation are sticking with their jobs.

These are tangible results that can be listed and analyzed. There are others that can be appreciated only by one who has visited the Studebaker plants and watched the men at their work; one who is familiar with the mechanical, stolid, listless, resentful, gloomy, disinterested attitude of employees in many factories and who compares this with the exuberant joy of living manifested by the Studebaker workmen. They radiate an atmosphere of good cheer and animated interest. At odd moments they are seen to be bantering one another. They always have something to say as they pass one another in their work, and what they say must be pleasant, for there are many grins and jovial expressions. And then when the lunch hour comes or the day's work is done, they start playing!

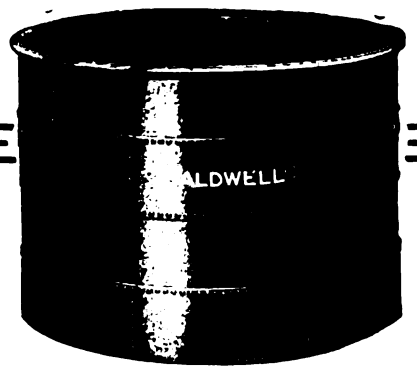
It is to this very playing that executives of the corporation attribute much of their success in reducing labor turnover, increasing production, and promoting contentment and good will among the men. There are, of course other factors, such as the anniversary check plan, the stock purchase plan, the vacation plan and pensions and life insurance plan—all features of the Studebaker Co-öperative system, which was inaugurated September 1, 1919, and which is now well known—but it is doubtful whether any of these have been quite so successful in bringing about the favorable results listed above as has the promotion of athletics in the organization.

Perhaps no other industrial organization in the country has so many employees actually participating in some form of athletic sport. To list the games and contests in which Studebaker teams are active is almost equivalent to cataloguing American outdoor and indoor sports. Major and minor executives, skilled and unskilled workmen, clerks and stenographers, both men and women, engage in practically every known form of athletics, not even omitting checkers. So comprehensive is the athletic program of this corporation, in fact, that its employees participate in sports practically every day or evening of the year.

Take bowling, for example. The Studebaker-Detroit plants boast six leagues, aggregating fifty-four teams, composed of several hundred players, in this one sport alone. By way of comparison it is interesting to know that no other plant in the city has more than 16 bowling teams. The Studebaker girls alone have six teams. In addition to inter-plant contests in Detroit, the Studebakers engage in inter-city contests with teams from the South Bend

(*Continued on page 48*)

Digitized by Google



We Ought to Know

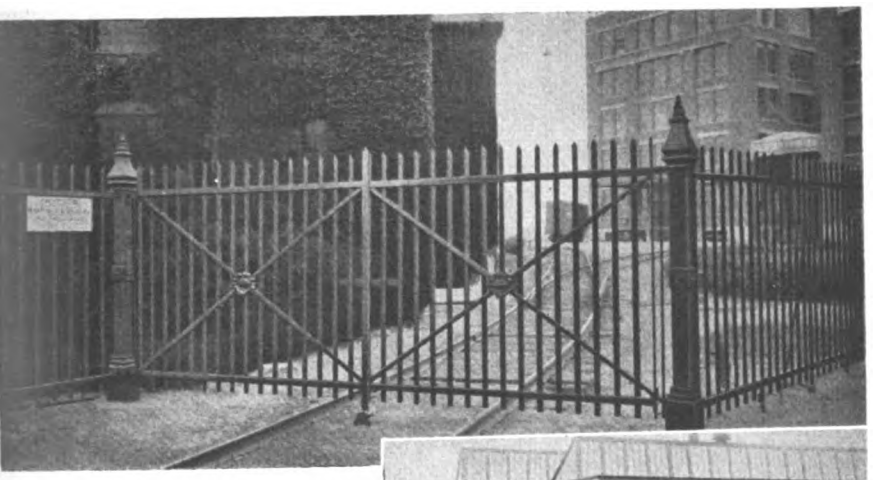
We've spent over thirty years building tanks for all sorts of uses. Our engineers, designers and workmen are constantly thinking tanks. Our products are living up to their reputation in all parts of the country.

The Caldwell Steel Tank is like our other products in that it reflects all the excellence of character that such experience produces. You can rely upon it for unusual performance.

Send for Catalog

W. E. Caldwell Co.
Incorporated
2200 Brook St. Louisville, Ky.

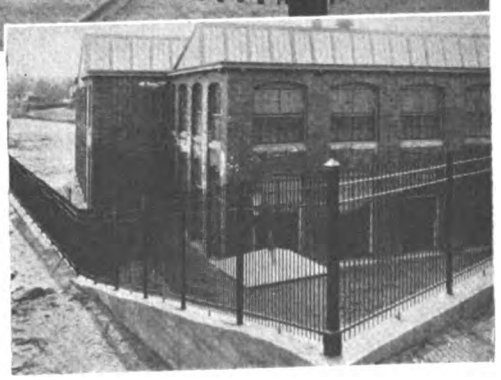
Caldwell TANKS AND TOWERS



Get Our Prices

before deciding you cannot afford that much needed fencing. Nine times out of ten fencing isn't as expensive as you think. Besides it's so convenient to make your selection the Enterprise way with exact costs figures and complete specifications before you.

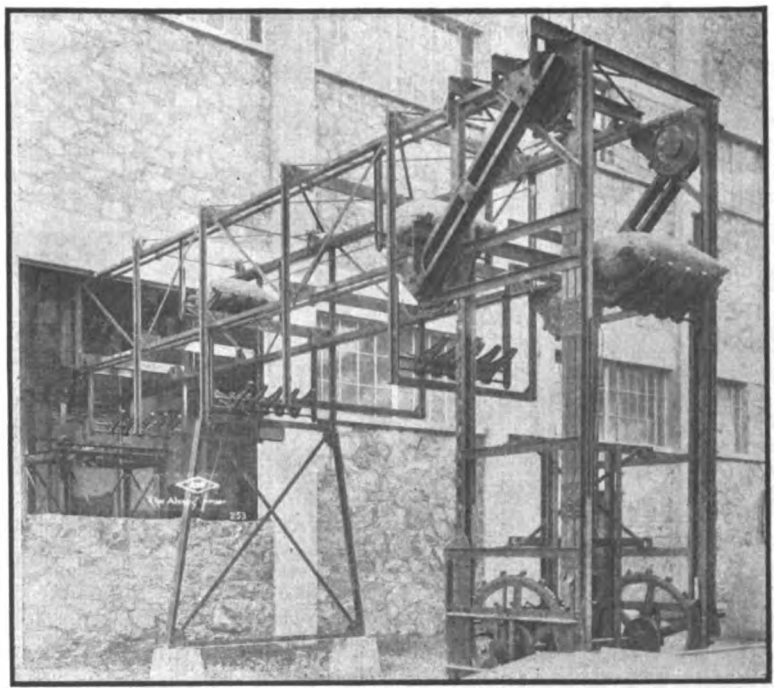
Send today for catalog—get a blue print of the fencing you are wanting just as it would appear installed—and know the cost. Then decide.



We offer you the benefit of 39 years of specialized experience in working out your fencing problems, large or small. Our engineering department is at your disposal. Let us help you.

Enterprise Iron Works
1108 E. 24th St. Indianapolis, Ind.

ENTERPRISE
All-Iron **FENCING** *Chain-link*



From platform to top floor—with one handling

Just such difficult handling problems as this are best solved by installing Alvey-Ferguson Conveyors. The Hershey Chocolate Company storeroom is five floors above the loading platform. This A-F Vertical Elevator carries the bagged cocoa beans from the platform into the building and up to the top floor where they are unloaded automatically. The only manual labor required is loading the bags at the platform. A 7½ H. P. motor operates the entire conveyor. An enormous saving over the truck and elevator way of handling.

CONVEYING A-F MACHINERY

Conveyors

Your plant, no doubt, often presents some such handling problem as this. No matter how out-of-the-ordinary it may be, you can put an A-F conveyor on the job at a saving of time and expense. A-F Vertical Elevators are designed and built for individual requirements such as yours. Where standard machines are not practical, our Engineering Department will design a special conveying system to suit your needs. Consult us on your handling. Write today.

Alvey-Ferguson Company, Inc.
Cincinnati, Ohio

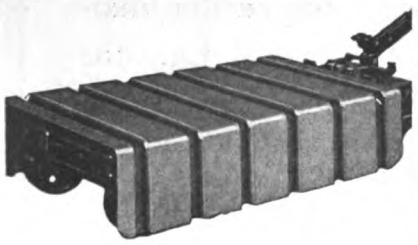
Digitized by Google

TRUSCON PLATFORMS
ALLOY STEEL



Steel Platforms Cut Cost of Handling and Conveying

Whether you use hand or power lift trucks, or a power hauling method, or an overhead conveyor system, or cranes, etc., you can save money through the use of Truscon Alloy Steel Platforms and Boxes.



Their sturdiness and scientific design ensures them long life without upkeep expense. Quantity production permits low prices. Made in numerous standard sizes and also to meet special requirements. Our extensive experience enables us to solve unusual problems.

Truscon Boxes for Steel Platforms

Skeleton boxes fitting any size platforms are furnished in various depths. They are either welded securely to the platform or equipped with steel stakes which slide into the ribs of the platform. Made of heavy gauge steel, reinforced with deep stiffening ribs and flanged edges. We make boxes to meet every requirement.

Tell Us Your Requirements for Anything in Pressed Steel Parts

Truscon Steel Company
YOUNGSTOWN, OHIO

Sales Offices in Principal Cities

(*Continued from page 46*)

plants and in industrial league contests with teams from other plants of Detroit. The Industrial Bowling League, composed of teams from thirty different industries in Detroit, was organized by H. D. Russel, recreational director for the Studebaker Corporation, and the Studebaker team always leads the league. It also defeats the South Bend team regularly in the annual contests, having won the championship each year that the games have been played. As this is being written, plans are being perfected for a championship contest between the different Studebaker plant leagues, for which the corporation is offering $250 in prizes.

"I have never seen anything to equal it in promoting a spirit of democracy and good fellowship," declares Mr. Russel, in speaking of the bowling teams. "Everybody bowls, from the superintendents to the office boys. The superintendent of this plant is manager of one of the leagues. Practically every foreman in the organization is an active member of one of the teams. And to show how democratic they are, one team is composed of a general foreman, a foreman, and three machine operators; and one of the machine operators is captain of the team."

Indoor baseball is another of the popular sports in which the Studebakers excel. Eighteen to twenty teams play at plant number three every day at noon. In championship contests the Studebaker team has won nine games and lost only one so far this season.

Some fourteen teams play baseball during the summer, though there has been some difficulty experienced in obtaining the use of playing diamonds in the city. The girls of each plant also have baseball teams and engage in interplant contests.

Basket ball is represented by a highly proficient team that engages representatives of other plants in the City Industrial league.

A standard shooting range has recently been established in one of the Studebaker-Detroit plants, conforming in every respect to the N. A. R. regulations, and it is expected that fifty or sixty members

(C page 50)

EFFICIENT HEATING

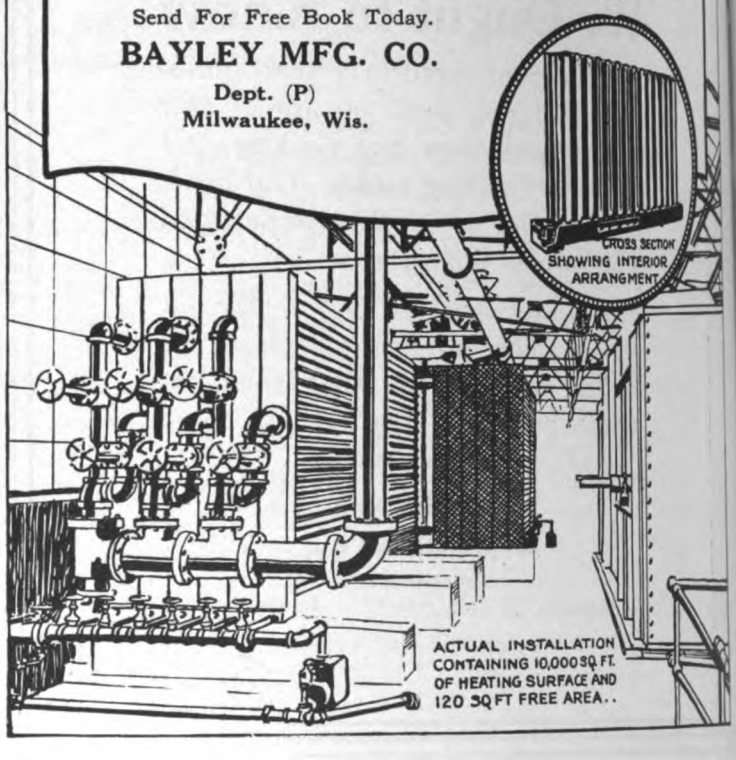
Demands Radiators so constructed that every square foot is prime heating surface.

Bayley CHINOOK HEATERS

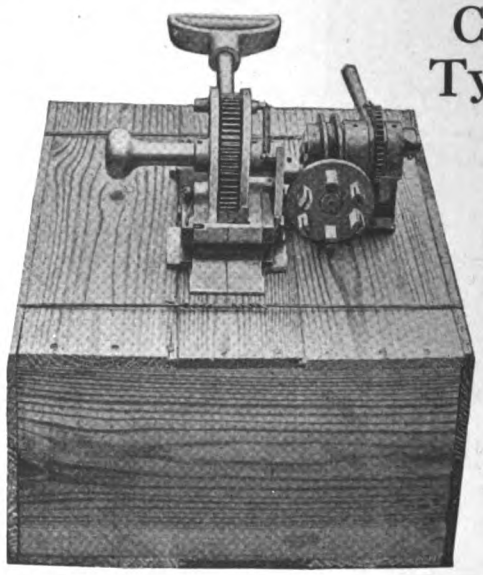
are built on the "tube-Within-A-Tube" principle, every tube a complete radiator in itself, free from water hammer, return bends, elbows and nipples. Any tube can be removed without interfering with any other tube. Can be shipped K. D.

Send For Free Book Today.

BAYLEY MFG. CO.
Dept. (P)
Milwaukee, Wis.



CARY'S Seal Tying Machine



The sturdiest and most efficient machine ever devised for the application of wire bands at any desired tension to all kinds of boxes, crates, etc.

Simple but Positive

in operation. Fool-proof and built to stand hard service. Weighs only 14 pounds.

The manner in which the wire is automatically sealed insures maximum strength and leaves no sharp ends to protrude and cause damage.

CARY'S Capped Bundled Wire



The wire with the patented shoulder

The Only Perfect Wire for Use in any Wire Tying Machine

A special drawn round galvanized wire in 13 and 14 gauge. The 13 gauge wire is packed in bundles containing 250 pieces; 14 gauge, 400 pieces in a bundle. Furnished in any length desired.

The patented shoulder holds the wire securely in any tying machine and absolutely prevents slipping. This is an exclusive feature.

Our method of bundling insures every wire being in perfect condition when received by you.

Prices and discounts furnished on application

CARY MANUFACTURING CO.
Brooklyn, N. Y.
Manhattan Bridge Plaza

Digitized by Google



The Bigger The Man The More He Needs It

The Dictograph System is your executive assistant. You sit at your desk and keep your entire organization at your finger tips—within five seconds of your voice. It keeps every man on his toes and the whole organization at concert pitch. Information can be had instantly, straight from the source, with no time lost by delayed connections; busy lines or laggard office boys.

Just Touch a Key and Talk

Back comes your answer quick as a flash and clear as a bell. You can talk direct, over a private wire with one or a dozen men at one time as easily as though they were seated in your office. You save not only your own time but that of every other executive. Today, with competition at its keenest, the co-ordination of trained energy—the economy of high priced men's time is a necessity in every well-balanced organization.

Ten Minutes Is Enough

Let us prove by a ten minute demonstration on your desk that the Dictograph System will save in a year more than it costs. Write us for an appointment.

DICTOGRAPH PRODUCTS CORPORATION

Charles H. Lehman, President

220 West 42nd St. **New York, N. Y.**

Manufacturers of the Acousticon for the deaf, the Motor Dictograph for Limousines, the Dictograph System of Inter-Communication, and the Dictograph Radio Head Sets and Loud Speaker.

MAIL THIS COUPON TO-DAY

DICTOGRAPH PRODUCTS CORPORATION,
220 West 42nd St., New York, N. Y.

☐ 10 Minute Demonstration—You may give me a ten minute demonstration of the Dictograph, with the understanding that it places me under no obligation.

☐ Free Booklet—You may mail "An Essay on Executive Efficiency" which analyzes the problem of intercommunication.

Name.....Address.....

Title.....Firm.....

Please Attach to Your Letterhead I. L.-5-23

Digitized by Google

(Continued from page 48)

will compose the newly organized "Studebaker Rifle and Revolver Club."

Other sports in which Studebaker employees are active are skating, swimming, track, boxing, wrestling, acrobatics, golf, horseshoe pitching and checkers. One evening each month they have the use of the Atkinson Community House, a civic community center affording a gymnasium and other facilities, and on these occasions from a thousand to fifteen hundred of them gather there for exhibitions and contests such as swimming, racing, boxing, wrestling, and jumping.

The Athletic Association of one of the Detroit plants conducts frequent noon-day meetings at which time the general welfare of the organization is discussed and prominent men are occasionally invited to speak. In the list of noted speakers are Edwin Denby, secretary of the navy; Senator-elect Ferris; Senator Townsend; Ralph O'Connor, author of "The Sky Pilot"; and James E. West, chief executive of the Boy Scouts of America.

The Studebaker employees are evidently musically inclined also, as they have two fifty-piece bands, a forty-piece orchestra, and numerous duets, quartetes, sextets, and octets, both instrumental and vocal. The musical organizations are frequently invited to play before very important assemblages, as well as for parades and patriotic demonstrations.

The annual picnic, held at one of the island parks near Detroit in August of each year, is the crowning event of all the Studebaker sports. Practically all employees attend, together with their families, and participate in games and contests of many kinds.

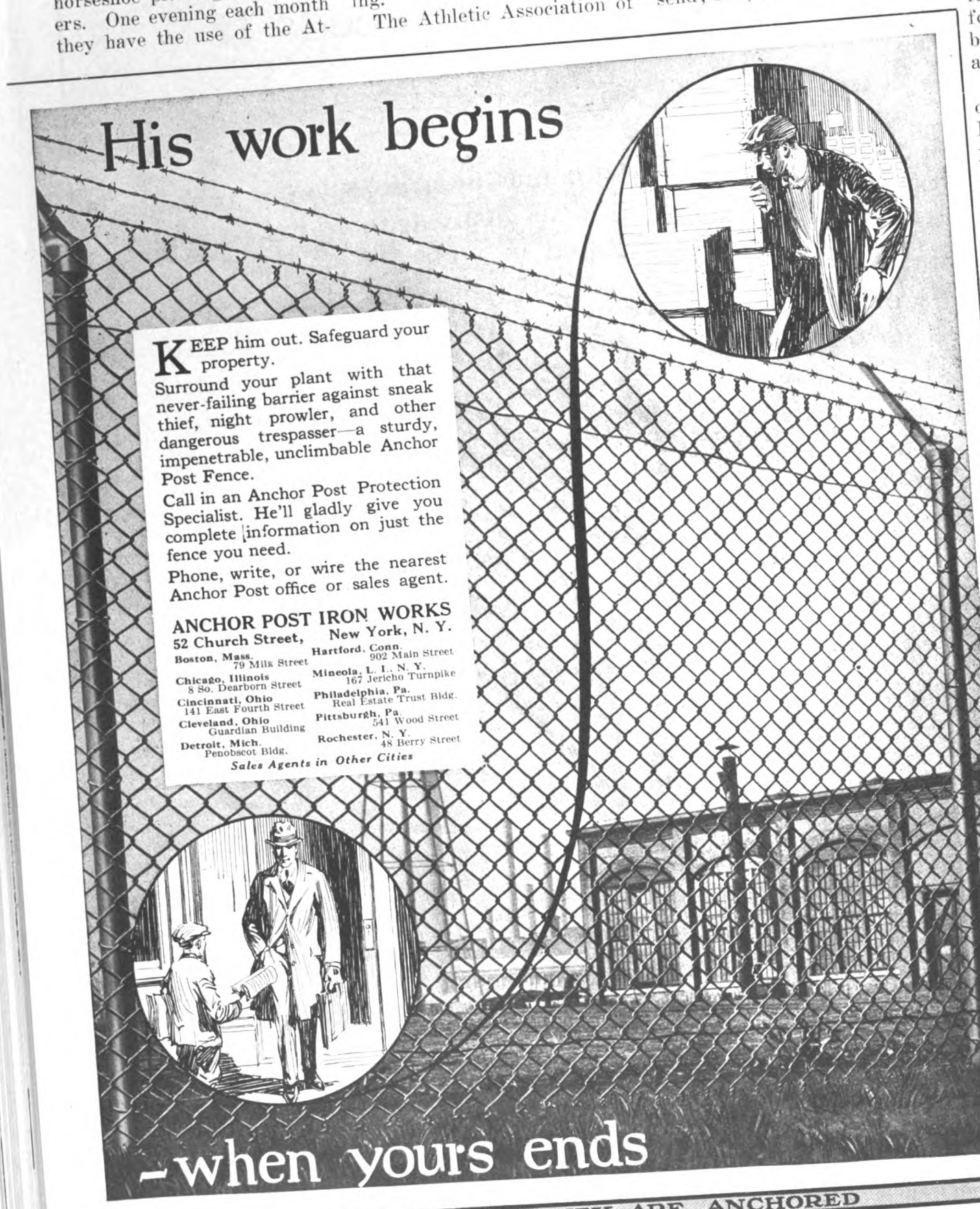
"Moonlights" on the lake and a winter frolic are fostered by an organization known as The Studebaker Manufacturing Club, and the proceeds are pooled for the benefit of Studebaker people who may need assistance. The frolic attains the proportions of an indoor circus and lasts for three evenings. Last year three automobiles, besides many lesser prizes, were given away in connection with this event and a large sum of money for the fund was realized.

Despite the enviable records which Studebaker athletic teams have earned, sports have in no sense been commercialized in this organization, every member of the teams being employed for the one purpose of building automobiles and not because he is a good athlete.

"The trouble with so many industrial athletic undertakings," asserts C. S. Slack, manager of the Coöperative Department, "is that they become obsessed by the desire to win at any cost, and in order to do so they employ professional players in some nominal position at a big salary. We have never employed any person for any purpose other than to build automobiles, or at least to assist in building them. Employing 'ringers' to play on the athletic teams destroys the very purpose of athletics in the organization.

"We always impress upon our employees the fact that our one job is to build automobiles. Whatever activity we may en-

(Continued on page 52)



Digitized by Google

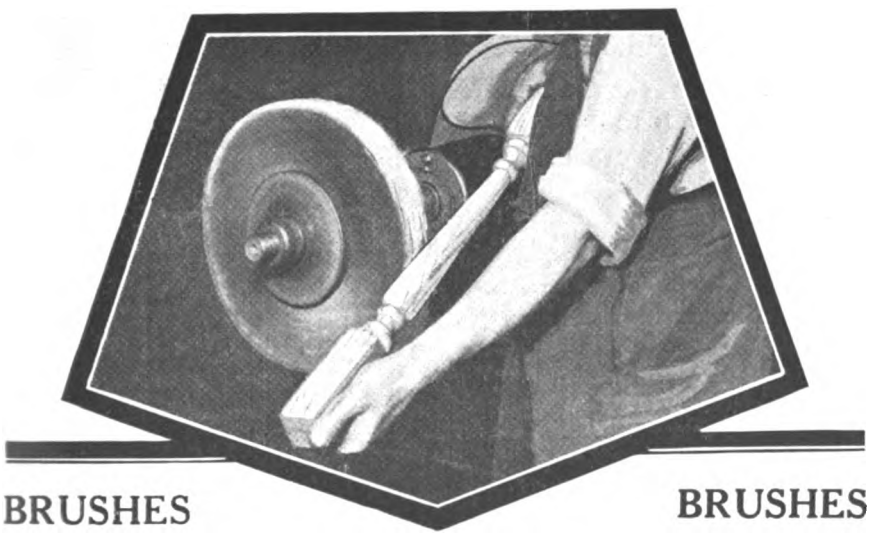
DIAGRAPH
YOUR SHIPMENTS

The Diagraph cuts legible address stencils for marking all packages, boxes, bags, cans crates, castings and similar material. Addresses do not blur, wash or rub off. Safer than tags. A practical insurance against lost and delayed shipments.

Try one free in your own shipping room—price complete with all supplies, only $110.00 delivered, in either housed or open models. Order one on trial—no obligation to buy—we pay all charges.

DIAGRAPH STENCIL MACHINE CORPORATION
1625 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities. See phone books.





BRUSHES BRUSHES

OSBORN ROTARY BRUSHES
are cleaning—

—gears.
—castings.
—flutes shanks of twist drills.
—ships.
—netting in coffee factories.
—cans in canning factories.
—moulds of all kinds.
—auto springs, both before and after they are assembled.
—compressed air tank plates.
—threads on pipes after galvanizing.
—carbon from boiler caps.
—metal parts after welding.
—structural iron work.
—tire carcass before retreading.
—scale from hot or cold forgings, tools, shovels, axles.
—brass or copper parts before brazing or plating.
—brass or copper tubing before polishing.

THE question isn't "*Do you* use rotary brushes?" It is "*Can you* use rotary brushes?" The Osborn Brush-Engineering Department is here to answer that question whenever you suggest—this week, if you say so.

Brush Division of
THE OSBORN MANUFACTURING COMPANY
INCORPORATED
New York CLEVELAND Detroit
Chicago San Francisco

OSBORN



The founders of this business are looking for jobs

TWO YEARS AGO the members of the sales department of a manufacturing concern whose product sold faster than it could be made resigned in a body to build a competing plant. All the money they had or could borrow went into machinery and equipment.

For a while the plant was a beehive of Industry. The company introduced to the market a good product at a substantially lower price, and it sold readily.

Today that factory is closed

The equipment will be sold at auction to satisfy debts. And most of the men who founded the business are idle, their savings gone, their assets pledged to creditors.

The magazine "Sales Management," commenting on the tragic incident, says;

> "It is the story of every concern that ever started in business with the idea that selling was all there was to business. It is just such calamities as this that prompt us to repeat what we have so often preached—sales managers must study the big, broad phases of business. Make it your business to know the problems of the production man, the credit man, the purchasing agent, and last but not least, the financing of the business. . . There has to be some head to every business, and that head must be able to see all sides of the problem."

You could hardly compress into one paragraph a better reason for the Alexander Hamilton Institute. It was founded by a group of business leaders who recognized that business makes specialists—but does *not* develop all-round executives. The vital way in which the Institute meets this situation is illustrated by another story.

This man succeeded

For fourteen years R. Lee Smith was a sales manager, with an ambition to have a business of his own. "But my work gave me no understanding of business other than that which concerned selling," he wrote to the Institute. "I knew nothing of production, financing or business promotion."

Instead of setting forth unprepared, Mr. Smith clipped a coupon from an advertisement like this. He received and read "Forging Ahead in Business" and enrolled for the Modern Business Course and Service. With this sound foundation he organized the United Soda Fountain Company, which in only three years has become one of the leaders in its industry.

Problems of production, financing, accounting, advertising, credits, did not come to him as new and unfamiliar. "Your Course and Service gave me an understanding of these things," he writes.

This is not an isolated instance. More than 200,000 business men have shared Mr. Smith's experience. They were executives, salesmen, accountants, engineers, lawyers, bankers, factory and office men. The Institute did not make them better specialists in the one department of business where their experience had been gained. It added to that a working knowledge of all other departments, with results, in progress and income, testified to by thousands of letters voluntarily written.

Send for the book they sent for

These men gained their first knowledge of the Institute thru "Forging Ahead in Business," a book which contains *all* the facts about the institute. Will you give it an hour in exchange for what it may give you in vision and in counsel? It will be cheerfully sent on this condition.

Alexander Hamilton Institute
776 Astor Place, New York City

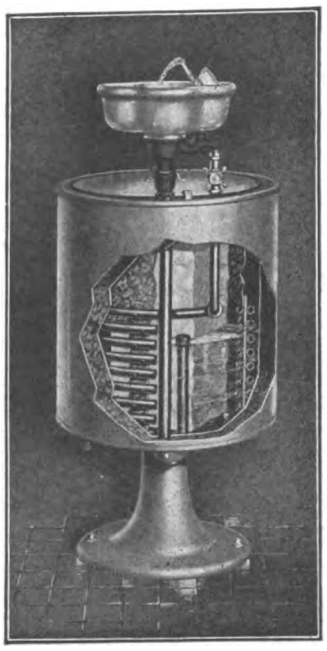
Send me "Forging Ahead in Business" which I may keep without obligation.

Name .....
Print here
Business Address .....
.....
Business Position .....

Canadian Address, C.P.R. Building, Toronto; Australian Address, 42 Hunter St., Sydney

Copyright, 1923, Alexander Hamilton Institute

Digitized by Google



570. A.

The automatic control maintains a uniform height of stream— *regardless of pressure*

HALSEY TAYLOR Cooler Fountains are never out of order, or the stream low and unsanitary, when the line pressure is down.

Automatic control keeps the stream at uniform height and the patented two-stream projector converges two streams of water with a retarding action at the apex of the arch forming a convenient drinking mound.

These are two of the reasons why HALSEY TAYLOR Fountains are recognized as more efficient by manufacturers everywhere.

More than a score of corporations have 100 or more HALSEY TAYLOR Fountains in daily use, and are constantly adding more.

Write today for 32-page catalog of new fixtures for every drinking requirement.

The Halsey W. Taylor Company
529 North Park Ave.
Warren, Ohio

BRANCHES

NEW YORK CITY
137 E. 43rd Street
PHILADELPHIA
5224 Greene Street
BOSTON
46 Cornhill—Room 512
ATLANTA
222 N. Jackson St.
CHICAGO
1702 N. Talman Ave.
KANSAS CITY
202 Baltimore Bldg.
SAN FRANCISCO
237 Rialto Bldg.
DENVER
401 Jackson Bldg.

HALSEY TAYLOR

(*Continued from page 50*)

gage in must have this as its ultimate goal. On the other hand, anything that furthers this purpose receives our hearty support. We don't pretend to be philanthropists; we are merely coöperating for the common welfare of us all."

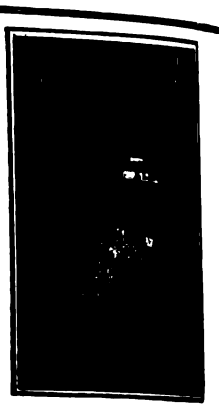
Mr. Slack brought forth a monthly record of employment, labor turnover, turnover in other industries, and production, and pointed out some of the more remarkable figures.

"There's the answer to your questions as to whether athletics reduce labor turnover and increase production," he said.

"There can be no doubt of the value of athletics in an industrial organization. You know the old proverb, 'All work and no play makes Jack a dull boy.' Sports give the workmen something other than the necessity of earning a livelihood to think of. They afford recreation and add a spice to his life that otherwise would be lacking. They promote team work, democracy, and good fellowship. They make better workmen because they make the workmen more cheerful, more contented, and more efficient. And better workmen produce more products. We foster and encourage athletics for everyone, from the highest executives to the most humble workman, because we know we all need to get out and play occasionally. Personally, I enjoy bowling very much. I haven't missed but once this year, and I wouldn't have missed then if I hadn't been out of the city." Opening his desk drawer and bringing out a box of cartridges, he went on: "We have just organized a rifle and revolver club and I have become a member. Here are my cartridges, all ready to get out and shoot. It's good sport and it is well for one to know how to shoot, anyway."

Questioned as to whether the intermingling of workmen and executives has a tendency to interfere with morale, Mr. Slack said that it does not; that as a rule the leagues are composed of players in the same or nearly the same class and that no unpleasant features had ever arisen. The fact that a machine operator may bowl against his foreman,

(*Continued on page 54*)



162 Tons of Coal saved per year

Quantities of fuel consumed in combustion never become productive. Heat is generated, but all of it is not utilized. From every surface there is constant heat radiation,—a source of unnecessary waste.

SIL-O-CEL

A CELITE PRODUCT

Sil-O-Cel Insulation forms a barrier to heat leakage, and in stopping this loss saves fuel. Take for example, an ordinary 500 H.P. Boiler. The fuel savings accomplished by installing a course of Sil-O-Cel Insulating Brick through the walls and over the tops of such a boiler will average 162 tons of coal saved per year. Savings are proportionate with other fuels—and in kilns, ovens, furnaces, oil stills, etc., the savings are even greater.



The facts regarding Sil-O-Cel show it to possess lower conductivity than any other insulation and adapted to all types of equipment without change in design:

Insulating Value—Powder 0.30; Brick 0.58 B. t. u. per sq. ft. per hr. per inch thickness per degree F. difference in temperature (U. S. Bureau of Standards), or one-tenth as conductive as firebrick inch for inch.

Resistance to Direct Heat—Brick and Powder 1600°F.; C-22 Brick 2200°F. without shrinkage.

Melting Point—2930°F. (1610°C.) U. S. Bureau of Standards.

Weight—Powder 15 lbs. per cu. ft. packed in place; Brick 1¼ lbs. each, equivalent to about 30 lbs. per cu. ft.

Crushing Strength—28 tons per sq. ft.

Forms—Brick, T Block, Powder, Cement.

A request will bring Bulletin W-6C containing complete information. Use the coupon or write nearest office.

Celite Products Company

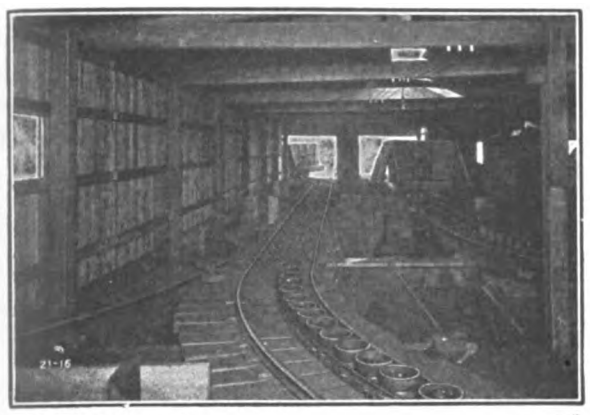
New York 11 Broadway-Chicago 53 W. Jackson Blvd.
San Francisco Monadnock Bldg.
Offices and Warehouses in Principal Cities
CELITE PRODUCTS LIMITED
New Birks Bldg., Montreal, Canada

Celite Products Company,
Gentlemen: We are interested in stopping heat waste. Send Bulletin W-6C describing the application of Sil-O-Cel Insulation, and tell us what it has saved in the following equipment:

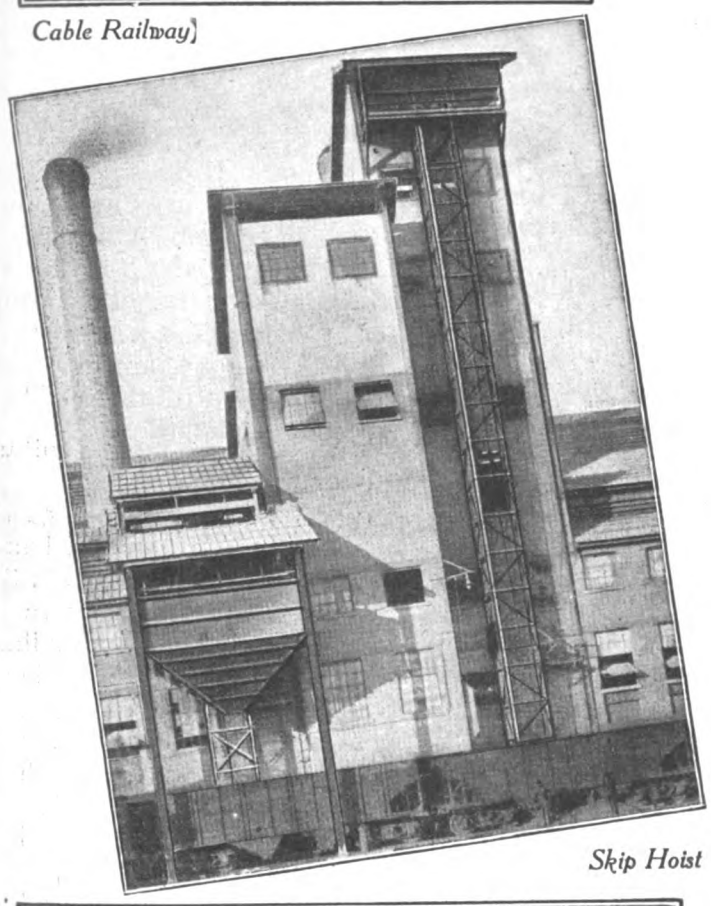
Type of equipment .....
Name .....
Company .....
Address .....

Digitized by Google

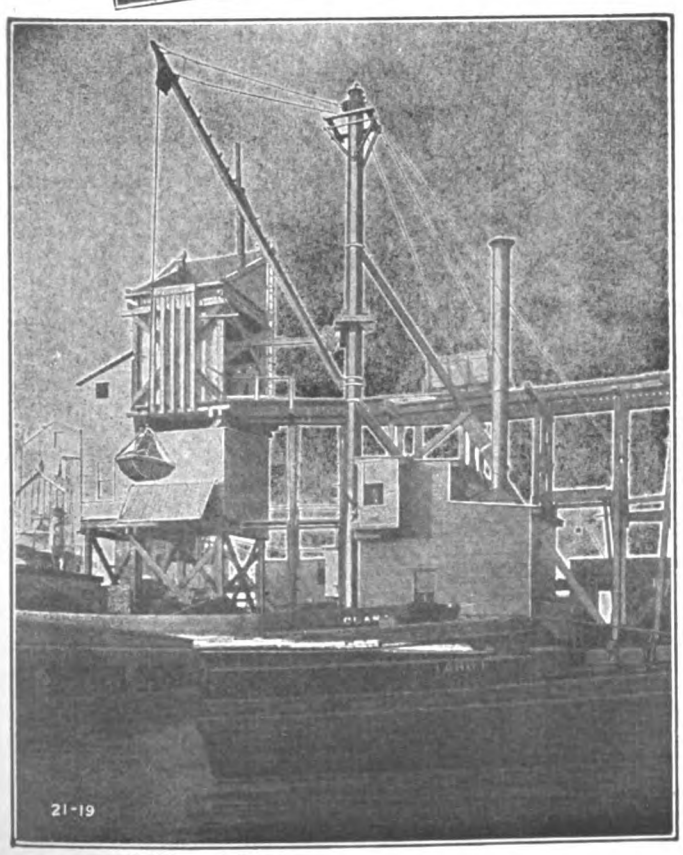
CONVEYING HUNT APPARATUS



Cable Railway



Skip Hoist



Mast and Gaff

Five Distinct Types for Cutting Handling Costs

THE diversified equipment shown on this page is saving in the cost and aiding in the speeding up of production in the various plants where they are installed.

By moving bulk materials without loss of time, at least expenditure for labor, maintenance and operation, they reduce to the minimum, wastage in the three essentials to profitable output—time, labor and money.

Built rugged, to withstand hard usage, they are nevertheless made with infinite care to insure proper functioning of every part to give the longest and most dependable service. This attention to the smallest details has been the Hunt policy for over half a century.

HUNT CABLE RAILWAY

For handling coal and heavy material from point to point. Used extensively in conveying coal from barge to storage bins. Standard gauge 21½ inches; curve radius 12 feet.

HUNT SKIP HOIST

Applicable to many material-handling problems. The automatic operation is controlled by the pressing of a button which sets in motion the elevating machinery drawing the bucket to the top of the tower, where the load is automatically dumped and the bucket descends. The picture shows two skips handling coal and ashes.

HUNT MAST AND GAFF

The simplest and most economical method of handling bulk material from barges. Easy to install; low in first cost; maintenance and operating costs at a minimum. Electrically or steam operated.

HUNT ELECTRIC MOTOR CARS

Rapid, rugged, reliable vehicles for transporting bulk, bagged and cased material. Single and double truck drives; built to operate on third rail and single and double overhead trolley systems. Operate on 12' 0" radius curves.

HUNT WEIGH LARRIES

Built to meet existing conditions with one way bifurcated chutes, to serve a single or double line of stoker hoppers. Accurate records of coal consumption registered on cards. Manually or electrically operated, either from boiler room, floor or cab.

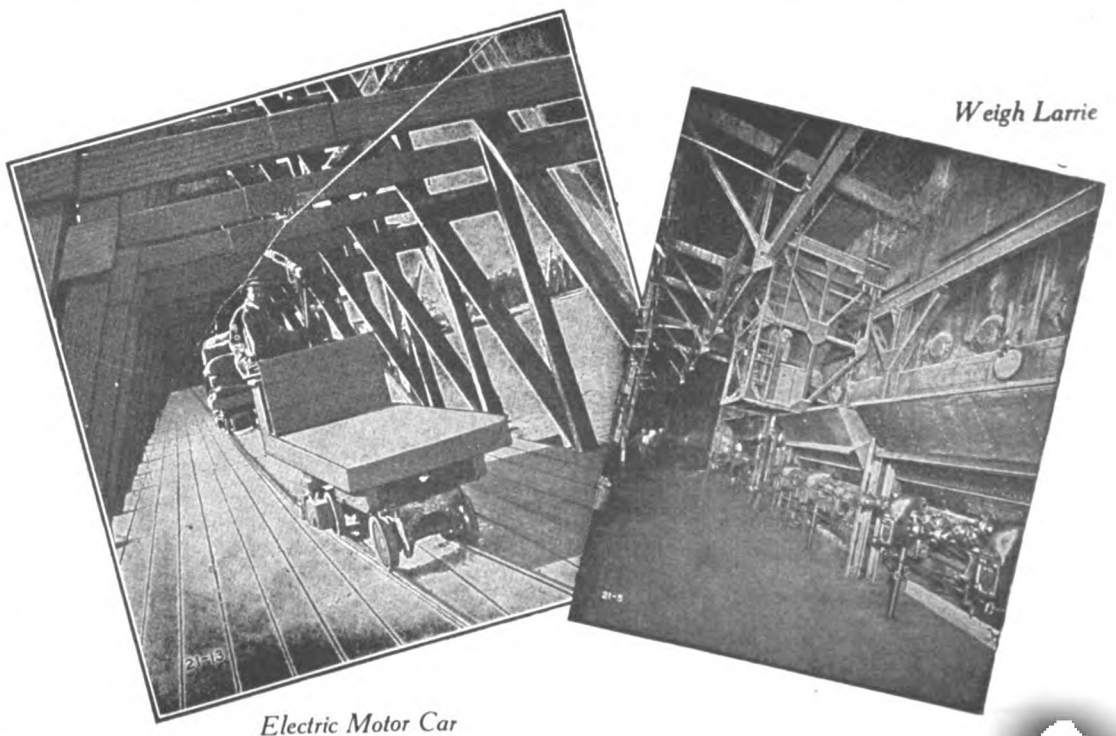
Let our engineers study your conditions and submit recommendations that will help put your plant on a profit producing basis—no obligations to you.

C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, NEW YORK

Ernest F. Learned
141 Milk St., Boston 9, Mass.

Philips, Long & Co., Inc.
538 So. Dearborn St., Chicago, Ill.



Weigh Larrie

Electric Motor Car

Digitized by Google



Lay in a Good Supply When Coal Can be Had

IT is your insurance against strikes, snow storms, car shortages and high prices next winter.

Learn by your experiences of preceding winters.

By use of the Scoop Conveyor you can make any open space about your factory an ideal site for your coal storage pile.

This machine unloads cars, loads trucks and transfers any kind of coal at the rate of a ton a minute and at a minimum cost per ton.

Design and construction based on that genuine practical experience gained through years of manufacture, installation and maintenance of thousands of portable belt conveyors, guarantees dependable economical, long time service.

Write for Catalog No. 158

Portable Machinery Co.
PASSAIC, N. J.

ask any user

THE SCOOP CONVEYOR

(*Continued from page 52*)

and defeat him, does not seem to arouse contempt in the workman for his superior in the plant.

No definite appropriation for athletics is made, such expenses as arise being cared for by individual allowances. Uniforms and other equipment are furnished such teams as use them, cups and other prizes are offered from time to time, and items such as transportation for the teams when they go out of the city are to be cared for. When these expenses are to be met, the recreational director submits a request to Mr. Slack for the amount needed and he puts the request through the proper channels.

In addition to their contests among themselves, Studebaker teams and individuals are leaders in all the phases of the work of the Detroit Amateur Athletic Association and in several Industrial Leagues.

A "New" Science, More Than Five Generations Old

(*Continued from page 17*)

of equipment is saving millions of dollars per year and is handling everything from grain to ashes. In some of the largest chemical plants throughout the country there are miles of conveyors and dozens of elevators. To enumerate the various material handled in this manner would require considerable space.

The equipment shown on pages 15 and 16 performs jobs and operations that, under present labor conditions, it is next to impossible to get men to perform. And why? Because the average laboring man does not care to do such heavy lifting and hauling, and the old days of "bull strength and a loud voice" are past. This matter of materials handling is just being given its proper place and we will find, as we investigate what has been done and what can be done, that a knowledge of the subject is worth money in more ways than one.

Take any picture in this group and see if you could perform the operation any cheaper through the use of manpower. How many men would it require, to move such loads by hand or by hand-truck? How many times would each piece have to be handled, due to the loading and unloading of these hand trucks? What would the cost be? These are all pertinent questions, but they are questions that each plant executive should ask himself regarding the methods of handling materials *in his own plant*. It does not matter whether you are using mechanical equipment or not; it is highly probable that by reviewing your handling problem you will find a number of places where improvements can be made, with the resultant savings in money.

The photograph on page 16, which shows a monorail handling tomb-stones, recalls to the writer an instance where a piece of materials handling equipment (a portable elevator or tiering machine) was used in a mausoleum to elevate the caskets when placing them in crypts. It is the only instance, to my knowledge, where this type of equipment is used as a passenger elevator.

Accepting the writer's suggested definition of materials handling as "the Science and Art of conveying, elevating, hauling, transporting or handling of materials from one location to another," it will readily be seen that the subject is very broad; and the very broadness of the subject is the reason why the average person has overlooked it.

Within the last few years, the American Society of Mechanical Engineers have segregated the subject, as a thing separate and apart from ordinary mechanical engineering. They even went so far as to form a Materials Handling Section of the Society in order to aid the advancement and discussion of this subject. A number of colleges are now planning a section of the me-

(*Continued on page 56*)

Digitized by Google

THE COAL CRISIS IS OVER

but Vigilant Feed Water Regulators are being installed in larger numbers and that's another good thing.

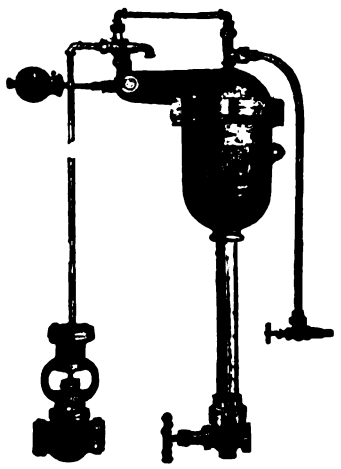
That's one good thing—

The need for saving coal is greater than ever for two reasons—coal has been higher in price than usual, and the quality has been lower, thus requiring the use of more coal.

Many companies are finding out that by installing Vigilant Feed Water Regulators they can keep the water level constantly within one-quarter inch of center gauge regardless of load or method of firing, and be assured that coal is not being wasted unnecessarily.

For the highest overall operating economies—you need a steady water level at all loads—for a steady water level at all loads; you need a Vigilant Feed Water Regulator. The first step is to find out, without obligation on your part, what the Vigilant will do for you. The second step is to write for catalog today.

VIGILANT
Feed Water Regulator



Write for the catalog today

The Chaplin Fulton Mfg. Co.
28-36 Penn Avenue
Pittsburgh Penna.

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width	$10.68
9½ " "	11.93
11½ " "	14.00
12¼ " "	15.45
13 " "	16.00
14 " "	17.59
15 " "	18.84
18 " "	22 00
18¼ " "	22.90
24¼ " "	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contraety bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. ***Our Customers will benefit.***

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company

(An Independent Corporation)

ROCHESTER, N. Y.



It Pays— In increased Production

A cooling drink and back to work—with EBCO Bubblers close at hand, the minimum time has been spent in going for a drink.

Modern production requirements necessitate the elimination of useless steps to distant hydrant or water pail with their dangers to the health of the workers.

EBCO Bubblers are built solid, substantial and sanitary—they are economical because of their rugged construction. No frills or unnecessary parts—EBCO Bubblers are all service.

Start now for maximum production during the hot sultry summer days by investigating the advantages of EBCO Bubblers.

Write for illustrated catalog and prices.

The D. A. Ebinger Sanitary Mfg. Co.
W. Town St. & H. V. R. R.
Columbus Ohio

Minneapolis, Minn.
Hampshire Arms

Detroit, Mich.
3942 Commonwealth Ave.

New York City
101 Park Ave.

Charleston, S. C.
258 Congress St.

EBCO BUBBLERS

Digitized by Google

UHL STEEL PosturChairs



The illustration shows seat tilted forward which brings the back with it. Note the straight line spine and the properly located back support.

This bindery operator is scientifically seated upon a Uhl Steel PosturChair, which increases her production, furnishes comfort during the entire day. And, her body is in the position health demands it should be.



The Uhl Steel PosturChair fits the body. The seated skeleton shows correct support. Note how the pelvic bones are relieved by the seat shape.

Fatigue is the thief of production. Incorrect support of the body breeds poor health. No employer would knowingly sanction impairment of health resulting from wrong chairs. And, increased production is being sought by every means. The Uhl Steel PosturChair is the answer.

PosturChairs have been designed in conjunction with, and are approved by the American Posture League of New York. Each chair bears label of approvel.

SPECIAL FEATURES: Made of cold rolled steel except seat and back which are wood. 10 heights each with 3" height adjustment. Seat tilts forward or backward. Swivel seats when wanted. Durably built, neatly finished.



This is the No. 8150-V-WB, 28" high adjustable to 31". Nine other sizes. Note shape of seat. Sit in it and be convinced.

TRY ONE AT OUR RISK

If you are seeking more production and greater health protection for your workers, write us for a sample to try under your own conditions. It's free for two weeks use. Mention height needed. Descriptive pamphlets available.

THE TOLEDO METAL FURNITURE CO.
1606 Hastings St., Toledo, O.
Manufacturers of steel equipment for factories, stores, offices and schools.

(*Continued from page 54*)

chanical engineering course, too, so that definite attention can be paid to materials handling and the design of materials handling equipment. Others are planning special courses on the subject.

Such action on the part of Colleges and the Engineering Society indicates that the next ten years will bring forth many new developments and improvements. The past is rich with experience, but because of lack of foresight on the part of the equipment manufacturers very little definite operating data is available. The present problem, when investigating this subject, is to obtain this data in written form. Many private engineers and some industrial plant executives have this information, but it needs wider circulation. Let us trust that more of this personal knowledge will find its way to the pages of the technical publications, so that all may benefit by the experience of others.

The Deserted Power House

(*Continued from page 26*)

ban (an automatic one, of course) will start up at the approach of a single car, and when the car has passed its radius will shut down again. No one is required to operate the station.

Of course an overload will cause damage, as, to melt the transformers and converters by overheating. The stations must be protected. When there is a blockade on the street car company's tracks the station automatically throws the excess load to adjoining stations, and reduces the load by means of reducing the voltage, which make the cars run slower.

It is said by authorities that the automatic station is more reliable than the regular operated houses with the human heads and hands in charge.

In case of trouble a light notifies the passing motorman that the station is out of service, and he telephones the office immediately.

The automatic station will carry an overload of 50 per cent. for [illegible] hrs. These stations [illegible] a difficult prob[illegible] fashion.

Figure the Cost Yourself



Anderson adjustable lighting fixture over sewing machine installation in C. G. Gunther's Son's, Furries, N. Y.

The actual cost is several hundred per cent less than nothing. Users claim increased efficiency from 5 to 25%. Take a minimum of 5% on $5 a day operator using artificial light with arm two hours a day and the least possible saving amounts to $18.75 a year. Add an average saving of $6.60 per operator on electric light bills, less first and replacement cost of the smaller lamps used, less breakage and elimination of fuse blow-outs and you readily see that.

Anderson Self-Adjusting Arms

will pay for themselves over and over again each year at the minimum of saving.

Increased efficiency is an important matter to consider. In plants where the Anderson Localized Lighting System have been installed the workers have always shown marked appreciation—it enables them to handle their tasks with less strain in shorter periods.

Do away with the antiquated method of "lighting the whole factory to thread a needle."

A demonstration by our lighting engineer entails no obligation. Send for a list of plants that we have already equipped.

Localized Lighting Corporation

of American Electric Equipment Co., Inc.

1478 Broadway New York

G.P.&F. Service
Knowing How Since '81

STAMPINGS—Pressed Metal Parts



Always Lighter—
Universally Stronger—
Generally Cheaper.

Many of the STAMPINGS and SHEET METAL PARTS that we make for the hundreds of manufacturers were formerly castings, forgings or wooden parts. To these manufacturers we have already proved the advantages of G. P. & F. Service.

But if you are already a user of pressed metal or make stampings in your own plant it will pay you to get our estimates on the work.



This 15 acre plant which every day turns out 100,000 parts of every description, in steel, brass, aluminum, copper, monel and zinc is devoted exclusively to the manufacture of stampings and pressed metal.

Our facilities and efficient production methods enables us to deliver pressed metal parts to your plant cheaper than you can make them in your own plant.

Prove it? Certainly. Send blue-prints or samples for estimates and compare.

GEUDER PAESCHKE & FREY CO.
1457-1750 CANAL ST., MILWAUKEE, WIS.
CHICAGO: 352-358 WEST OHIO STREET

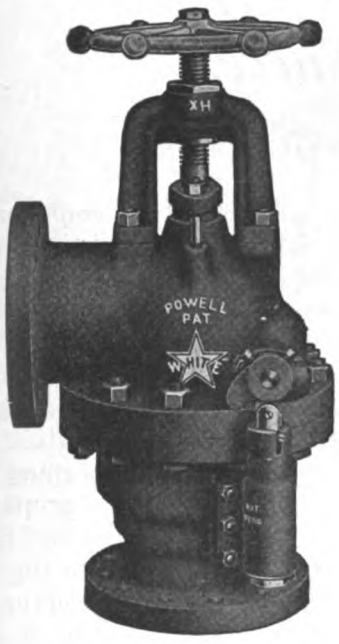


Over 15 Acres of Floor Space—

Digitized by Google

POWELL VALVES

Safety Insurance for Your Plant



Backed by 75 Years Experience

Powell Triple Acting Valves automatically close when a tube bursts —isolating the boiler.

POWELL WHITE STAR VALVES

guarantee the user unfailing dependability because they combine the most practical and serviceable mechanical factors.

Two reasons for their long life are their regrindable, renewable discs, both cast of Non-Corrosive Powellium Nickel.

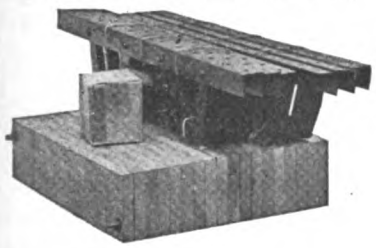
Medium and Extra Heavy for steam working pressure up to 200 and 300 pounds.

Write for our latest booklet.

The Wm. Powell Co.

2525 SPRING GROVE AVENUE CINCINNATI, OHIO

At Right—3 Enterprise Platforms assembled.
Below:— 3 Enterprise Platforms ready for shipment, showing why they take a class three freight rating.





Shipped Anywhere at Low Cost

Last Indefinitely

The combination wood and steel construction of Enterprise Platforms makes them so strong and durable they last indefinitely. They won't break down under heavy loads like the all-wood platforms you make —and practically eliminate the expense of costly repairs or replacements. In final cost the cheapest platforms you can buy or make.

Made in all Sizes

If you will give us the following information we will quote you promptly on a platform to meet your requirements:

Measurements Desired

Length of top over all.....
Width of top over all.....
Clearance between runners.....
Style elevating truck used.....
Height of truck base when lowered.

ENTERPRISE PLATFORMS for elevating trucks are shipped *anywhere* at an *exceptionally low cost.* They come to you knocked down— take a class three freight rating— which means a substantial saving on the shipping cost.

Everything is complete, ready to assemble, with necessary bolts, nuts and lock washers. Top boards are finished on four sides, cut to length, bored and countersunk for bolts. Easily assembled in a few minutes.

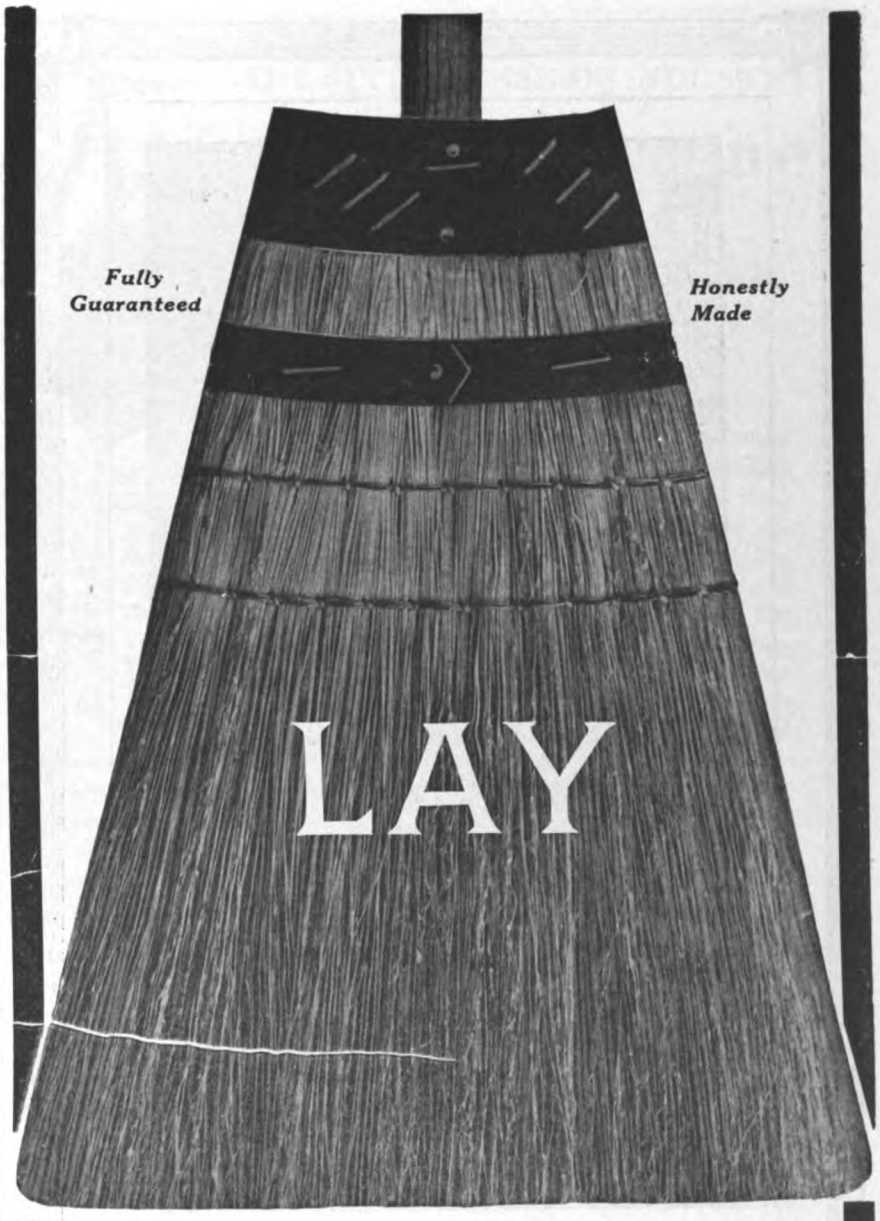
Enterprise Platforms cost *so little,* and are built *so strong,* you can't buy or make platforms of equal strength for less money.

Send measurements and get descriptive literature and prices.

ENTERPRISE IRON WORKS
1161 E. 24th St. Indianapolis, Ind.

ENTERPRISE PLATFORMS

For Elevating Trucks —Hand or Electric



Standard for Forty Years

ECONOMY



No. 256-144 Steel wire Push Broom



No. 412 Bench Brush



No. 28-H Bassine Whisk



No. 253-165 Bass Push Broom



No. 3-W Steel wire Casting Brush

Brooms that have won the specifications and re-orders of 40% of the railroads, 40% of the steel industries and over 4,000 leading industrial plants, large and small,— with a record going back 46 years—

HAVE EARNED A RIGHT TO SWEEP FOR *YOU*

Lay Metal Case Brooms wear about twice as long as ordinary brooms; they hold their shape. They hold their customers.

SEND FOR LATEST PRICES NOW

For every type of floor and for every material that can be handled with a broom there is a Lay Broom proven in long service. Lay Brooms *must make good* or *we will.* Check and sign the coupon. Mail it to us. Let us show you genuine broom economy.

THE JOSEPH LAY COMPANY

120 College Street

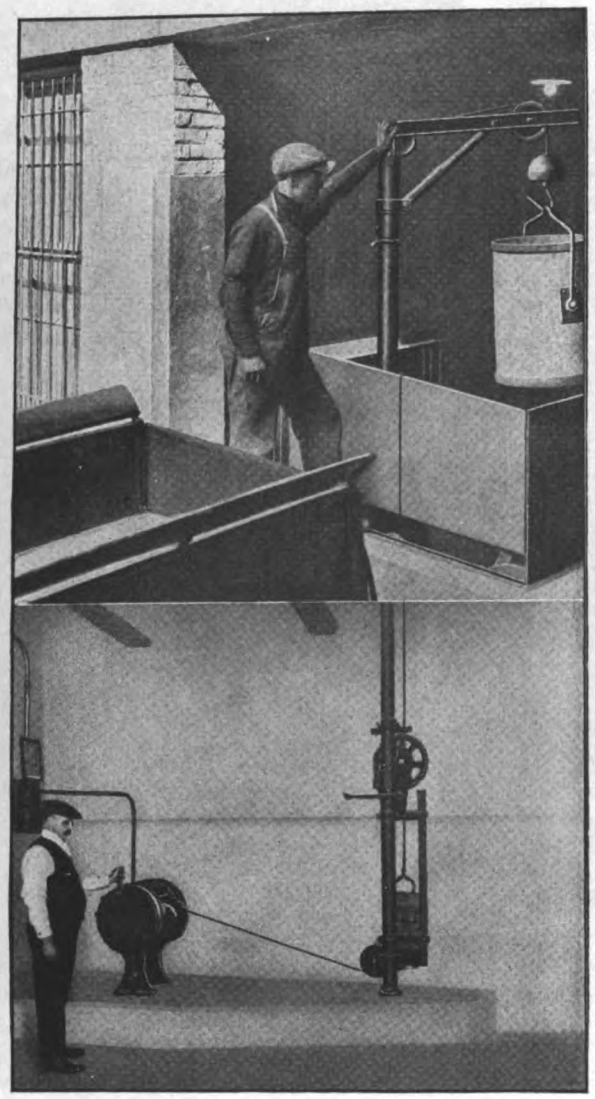
Ridgeville Indiana

Originators of the Metal Case Broom

COUPON

The Joseph Lay Co.
Ridgeville, Indiana
Please send us your latest prices and recommendations
Floors are (material).....; dry, damp, wet. Brooms must handle dust, heavy dirt, sawdust, filings.
Special uses.....
Firm Name.....
Location.....
Inquiry by.....

Digitized by Google



Railroads believe in safety. Note use of G&G sidewalk doors with spring guard gate to protect sidewalk opening

Railroads too, find this Hoist desirable for ash removal

THE Illinois Central R. R. has used a G&G Telescopic Hoist (Model C) since November, 1919, in its 53rd Street freight station in Chicago. This model is operated electrically at very small cost for current. (A recent test of an electrically operated G&G Hoist indicated that ashes were raised at the rate of 15½ tons in one kilowatt hour.)

The Pennsylvania R. R., the New York Central Lines, the Baltimore & Ohio, the Southern Railway and the Canadian Pacific are a few of the other railroads using G&G Hoists for ash removal. Hundreds of factories, institutions and garages are also removing their ashes the G&G way.

Write for booklet "Industrial Plants Need This Hoist."

GILLIS & GEOGHEGAN

556 West Broadway New York City

The G&G ELECTRIC REG. U.S. PAT. OFF. Telescopic Hoist

The Pot of Gold Under Our Hats

A Workable Recipe for Business Success

BY FREDERICK H. MCDONALD

HOW atrociously poor so many of us are. And what a fine piece of drollery that so few of us want to be poor!

How often the slogans catch and hold our eyes—"More money for you!" Unerringly they prescribe that which is beyond most of us—the investment of actual money. So we pass them up, a nod of recognition tempering our regretful good bye. They are fine enough for the other fellow but downright awkward for us.

Yet, there ought to be some way out of it all. Not that we give a continental, of course—it's the principle of the thing! Those of use who have cut our eye teeth have long ago discarded the notion that the world owes us a living. We have regretfully vetoed the fallacy fathered by our constitution that all men are created equal, and have come to recognize that in our democratic country it is to equal opportunity and not equality of station that we are born.

The great question with us all is how to realize this opportunity. Not how can we spend more. How, with what we are already endowed, can we make more?

Have you ever seen that picture of a sad looking old Bossie stretching her neck over a rail fence, trying to curl her hungry tongue around a neighbor's lean corn blades—and herself up to her knees in rich green clover? Well, aren't a lot of us like that? Always looking somewhere else, or to somebody else, for our big chance, when as a matter of plain fact we already have within us the power to start our own selves chugging up the grade to a piping measure of ...cess.

...ow often have we looked ... over our work or a por... of our lives, and figured on how much work we could have accomplished if we had really exerted ourselves—had really pulled out of ourselves the qualities we always felt were there. How often are we surprised when we see a man thrown up against a situation for which he has seemed to have had no adequate preparation or experience, to find that he measures up well to the responsibility, or the opportunity—how great a number of apparently mediocre people are getting away successfully with jobs that we would readily enough have conceded to have been beyond their powers.

The stuff is there—if we would only use it!

Not only in ourselves is it there, but in an even larger accumulative degree is it in those who work with us and for us. So many of us are dependent in getting results upon the coöperation and efforts of others, that it is quite as vital and vastly more profitable to insure a development of their latent capacity as well as our own.

Just as we can cure none of our economic ills by itself, we can get no lasting results in a permanent general advancement by picking on just a few individuals. It is the general level of the whole business structure that must be raised. And it is to the existing structure—our stores, offices or factories—that we can look to find out what conditions are, and just what the possible developments can be. It is towards these that we must direct our efforts if we would create an effective realization of the existence of a great field of possible resource that is now largely overlooked—the clover that is tickling our very shin bones. We can at least try to give some of them a whiff of it.

Now there is a lot of argu-

(Continued on page 60)

Digitized by Google

THE SEAT OF
Production



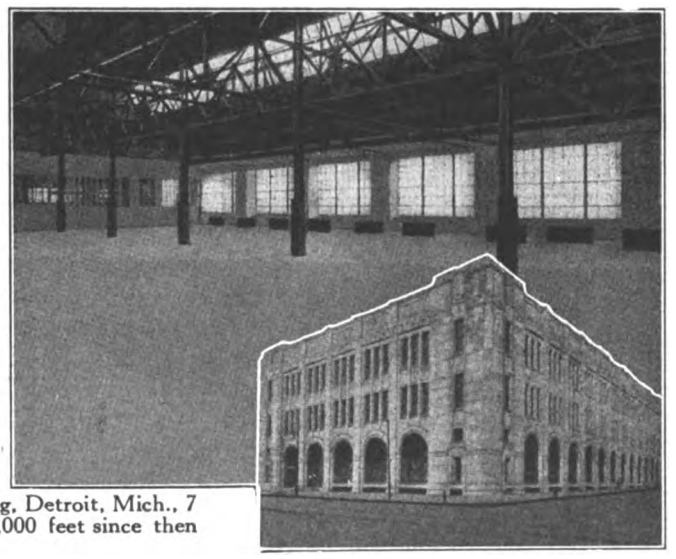
No. FS-22, Patented.
Adjustable Legs and
Back-Rest

The instrinsic value of Factory Chairs and Stools is not in their purchase price, but what they do to increase the efficiency of the worker.

Royal Metal Mfg. Co. 2312-18 S. Western Ave., Chicago

"Royal-Chicago"
PRODUCTS
THE CORRECT INDUSTRIAL SEATING

Fireproof
Non-Abrasive
Resilient
Warm
Permanent
Sanitary
No Upkeep
Attractive
Economical



30,000 feet of Marbleloid installed in the Evening News Building, Detroit, Mich., 7 years ago. 20,000 feet since then on re-order.

MARBLELOID
The Universal FLOORING for Modern Buildings

Use the coupon below to bring you information about this flooring for Offices, Hospitals, Cafeterias, Welfare Rooms, Laboratories, Libraries, Display Rooms, Workrooms, Power Plants and other rooms in industrial plants.

The material is manufactured and the floor is laid in seamless plastic form by our organization. The responsibility is not divided, therefore we guarantee the floor in every way.

THE MARBLELOID CO., 467 Eighth Ave., New York

THE MARBLELOID COMPANY, New York City: Without obligating myself in any way, please submit tentative estimates on the cost of your product installed complete for our building.....
.....; below are the approximate areas involved.
Floor.....Sq. Ft. Sanitary Base.....Lineal Ft.
Wainscot.....Sq. Ft. I have checked the floor troubles we now have.

Our floors are
☐ New Concrete ☐ Cement Finish ☐ Wood
☐ Cracking ☐ Cold ☐ Slippery
☐ Dusting ☐ Splintering ☐ Unsanitary
☐ Noisy ☐ Rough ☐ Rotting

Name .....
Firm .....
Address.....
☐ Please send 32-page Illustrated Booklet

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Control



If odor alone determined the quality of Milady's perfume!

THE poet who sang so sweetly of "the delicate odor of mignonette" as reminding him of his sweetheart never dreamed that, in modern times, most perfumes would be derived, not directly from flowers, but from the chemical treatment and blending of natural or artificial colorous substances. Thus, the scent of lilacs is produced from oil of turpentine; and the preparation of a substance called "ionone" yields the odor of fresh woodland violets! The story of the creation of every scented article—from toilet soaps and powders to the delicate suggestion of perfume in feminine notepaper—is a romance of chemistry in which temperature control plays a vital part. One of the most important things that must be determined in regard to the essential oils that are the basis of many perfumes is the boiling point. Also, at each different temperature in their distillation, a different product results from the same process. If sense of smell alone guided the perfumemakers, the result might not please Milady's critical taste when the finished product was reached! But to the senses of sight and smell are added that "sixth sense"—Temperature Control—supplied by the accuracy of *Tycos* Pyrometers and other *Tycos* Indicating, Controlling and Recording Instruments. For the most delicate odors, extracts and essences, the most delicate control in distillation becomes possible—the truest knowledge of the exact state of each ingredient—thanks to the exactitude of the information given by *Tycos* Instruments. It makes no difference what the product treated or the result desired.

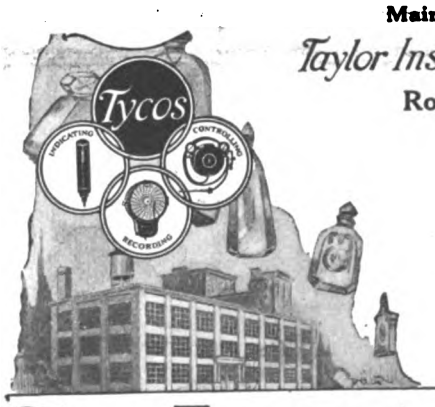
Are your problems chemical? Do they involve the indication and control of heat to the last part of a degree? If so, there is a type and style of Instrument in the *Tycos* Line, embracing as it does over 8,000 varieties.

Write us and literature on any instrument will be sent promptly and our experts will advise you in its application to your processes.

Tycos in the Home

Tycos Wall Thermometers
Tycos Quality Compasses
Tycos Stormoguide
Tycos Fever Thermometers
Tycos Office Thermometers
Tycos Hygrometer
Tycos Bath Thermometers
Tycos Home Set

Your dealer will show them to you. Ask us on a postal, for booklets on any one of the above.



Main Office and Factory
Taylor Instrument Companies
Rochester, N. Y.

Canadian Plant
Tycos Building
Toronto

There is a *Tycos* or *Taylor* Instrument for every purpose.

Tycos Temperature Instruments
INDICATING · RECORDING · CONTROLLING

Digitized by Google

(*Continued from page 58*)

ment going on these days about fundamental propositions that do not seem to have developed as some folks think they ought to have. Our sense of efficiency seems to have led us into a dangerous routine of time and method. We are being warned that our machines are turning us into machines and instead of giving us more freedom of action and thought, are making rutted slaves of us, and killing initiative and effort. We are told that when we determine by time studies that a man can make so many continuous motions per minute without tiring, we fix our standard of performance equally as definitely, set a limit of performance for a given type of work done with given tools by a given type of worker—and that pretty soon we won't be able to increase production to meet new demands. We hear the cry for better types of workers to take over the problems of our big business, smothered by the cry that it is the wastes of our industries that is choking our efforts to get better results.

Always there is some one element that somebody is trying to separate from the whole, to curve off by its lonesome, forgetting, or failing to realize that each is so interwoven with the other that the whole must be ministered to if the parts are to improve.

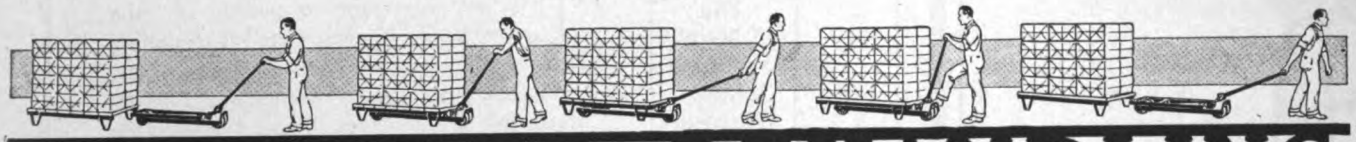
What we want to do is to find some one effort that can be far reaching enough in its effects to help all the parts a little, and thus, by even that little to raise the general level of the whole structure. Something that will clamp down on this thing of turning us into machines—that will cut out some of the wastes in time and energy, and that will enable each of us to better ourselves and our welfare.

We want to overcome to some extent the conditions which make it possible for so much of our lack of success to result more often from our failure to use all of our own potential resources than on the combination of any group of circumstances that might be the apparent cause of failure. We want to find that clover at our feet—and feed on it.

The clover at our feet. Has it ever occurred to you that the real thing exists already—in our heads? Have you ever realized that the greatest dormant force in the world upon which man can draw, or over in any way exercise control, is not the heralded power of the tides, not the vast powers of our unbridled water falls, nor even the unbottled rays of that greatest of visible energizing forces, the sun? That it is the waste power in the undeveloped human mind? Even alone, this is the most effective force in the universe over which we can exercise control—the trained intellect. Just it is the harnesser, the utilizer, and the adapter of all of nature's otherwise unguided powers.

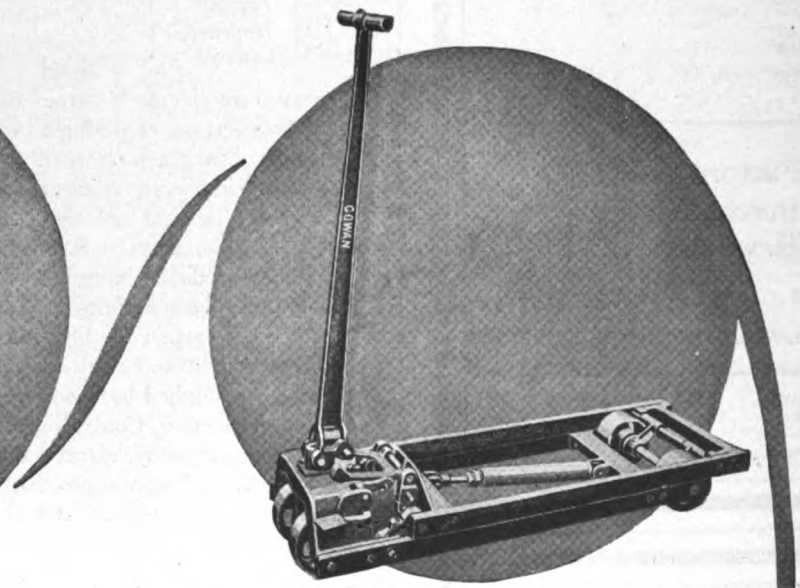
Think of the unnumbered possibilities that even the possessor never realizes exists until favoring chance brings them to light—let us not leave them entirely to chance.

Prior to the war, gauging from the results of time studies and the effects of piece-work and bonus systems, it was reliably estimated that in tasks where he had nothing to gain



ELIMINATE REHANDLING





Skid Platforms for Your Loads *and* A COWAN Hand Lift Truck



The Cowan System in a tannery. Handling leather



In a lumber mill. Handling door and window frames



In a wholesale grocery. Handling boxed and packaged goods.

HE steps on the foot pedal and with a single downward sweep of the truck handle quickly and easily picks up the skid body with its load.

At destination, he simply steps on the foot pedal—and skid body with its load is quickly and gently lowered to the floor.

His load handling capacity is greatly increased. With one Cowan Hand Lift Truck and its complement of inexpensive Skid Bodies, he duplicates the work of many men and an extensive equipment of ordinary trucks.

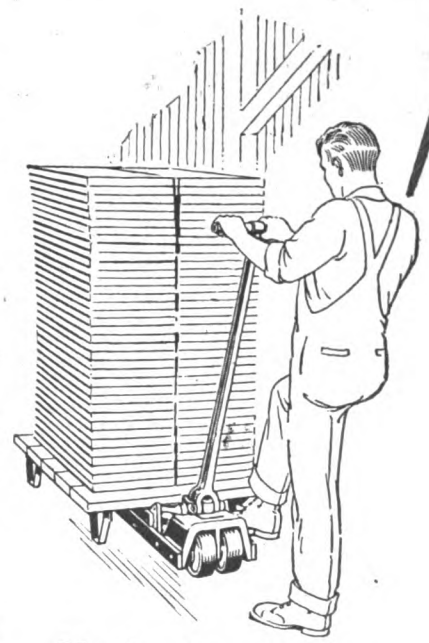
Accomplish more work with fewer men. Reduce your trucking equipment investment. Cut down your truck replacement and maintenance expense.

Cowan Skid Platforms or Bodies are ruggedly constructed but inexpensive. Maintenance practically negligible. A supply adequate to your material handling needs, together with one or several Cowan Hand Lift Trucks, *costs considerably less* than a commensurate equipment of ordinary trucks.

Write for complete information on the application of this Cowan System to your particular load handling requirements.

COWAN TRUCK COMPANY
6 Water Street, Holyoke, Massachusetts
Representatives in New York, Chicago and all other Principal Cities.

Largest Manufacturers of Complete Hand and Electric Industrial Truck Systems.



Under the Skid Up and Away

2067-N

COWAN INDUSTRIAL TRUCKS-TRACTORS



Digitized by Google

· extra exertion, the average iciency of the workman from ıy to day was not over sixty-·e per cent. of what he could ·complish. This a v e r a g e uld be, and was raised from n to twenty-five and thirty ›ints for continued perform-ıce by the use of various sys-ms of payment which gave ldditional reward for addi-›nal effort. While these fig-·es were the result of tests ade in the shop with shop orkers, there is no reason to ·lieve that they will not apply a general way for even the hite-collared contingent, the lministrative forces. In fact ıey ought to hold quite true ›r all of us, of whatever class, ·eed, or line of endeavor in ır attitude towards our daily ork. The dormant extra con-nuous effort is in us. All we ave to do is provide a recog-ition of it, and an incentive › pull it out.

When, less than a generation go, those same time studies nd bonuses first turned our yes from the machine as a nit of production to the man ehind the machine as the ıore vital factor, an era was ıaugurated that has put pro-uction in the field of science, nsuring a possible output suf-·iently approaching a hun-·red per cent. to well warrant query as to what more we ıay expect.

Yet we hesitate to think that uch results represent the limit f possible attainment in any ·ork. It is true that the phys-·al capacity of the man may e approached. It is equally rue that the tools or machines ıay be working up to their imits. But—what about an-›ther type of tool, another ·ind of machine, or even an-›ther form of process? In ›ther words, what about the pplication of a little brain-·ork? Though our physical apacity can be enlarged under given conditions, there is a imit beyond which even in-·entive cannot draw us—the imits of our individual mental apacities have never been ·ven approached.

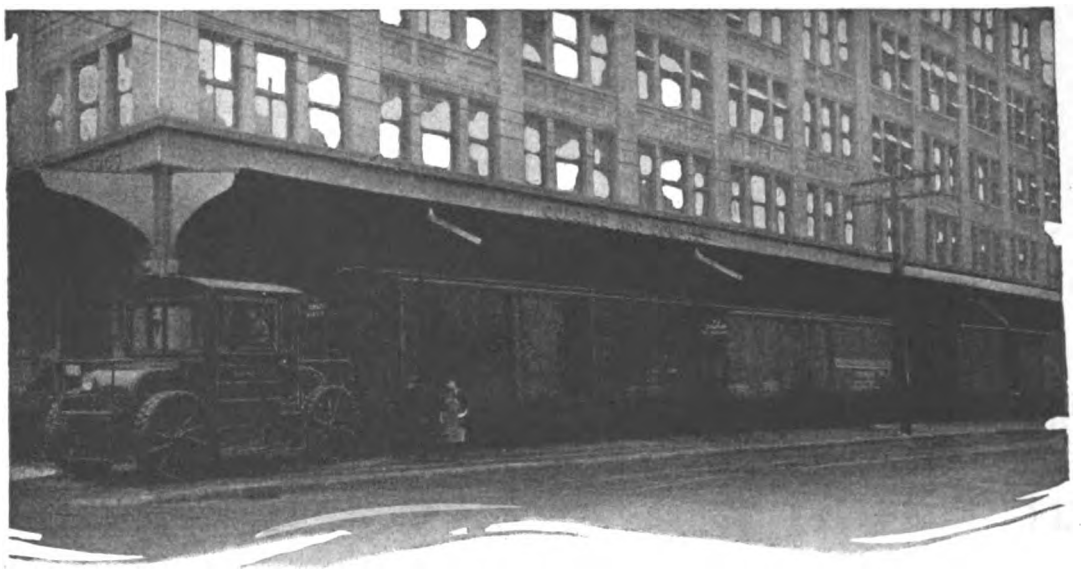
We have now reached the stage in industry and business when we must definitely turn rom a study of just the man ›ehind the work, to a further study of the enormous possi-›ilities which lie in developing he brain behind the man!

It is time to weld one more, if not the greatest link as securely in the chain of production as we now have welded together the accepted functions of management, with labor and tools. We must make the widespread acceptance of this term management applicable to the individual worker. In addition to the great factor we now recognize as executive management, we must create a new conception of a personal management of his own job by each individual.

If employers can ever succeed in instilling an appreciation of the work to be accomplished, instead of the machine to be run, the car to be sold, or the books to be kept, in the man who is tackling a definite task, we reach up into the illimitable field of human imagination and ingenuity. Instead of being in danger of reaching the limit of production, we will find that we have so far only tapped the real capacity of our workers, and have put it within the lot of each of them to better himself and his welfare.

The accepted task of the

SKF



Ball Bearing Electric Tractor

Hauls Freight Cars at Cost of $.067 per Car Mile

STORAGE-BATTERY tractors were put in service in 1913 in Jersey City to replace horses for hauling freight cars to the doors of certain industrial plants.

During the first seven months of operation, 4,935 cars were handled at a cost of $4,627.88, or $.067 per car mile, as opposed to $9,179.10 with horse haulage. These tractors weigh 28,850 lbs., are equipped with two 85-volt, 60 ampere, 900 R. P. M. motors and have a draw-bar pull of 8,000 lbs.

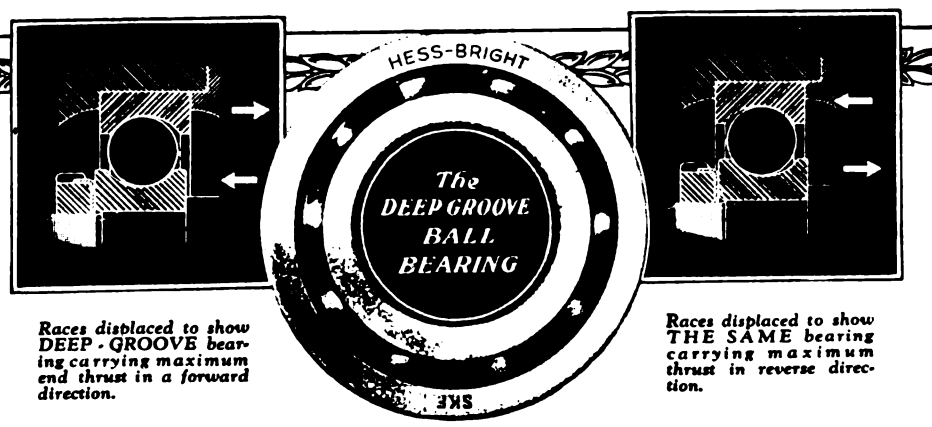
Deep-groove ball bearings made by the Hess-Bright Manufacturing Company are used on the motor shafts, motor pinions, counter shafts, differential gears, driving wheels and steering-gear pinion. In this way the maximum mileage from a battery charge is insured and the rotating parts are protected against displacement, as ball bearings operate practically frictionless and develop no appreciable wear.

Whether your bearing problems deal with railway, automotive, industrial or scientific equipment, the services of our engineering department are at your disposal.

THE HESS-BRIGHT MANUFACTURING COMPANY

Supervised by SKF INDUSTRIES, INC., 165 Broadway, New York City

926

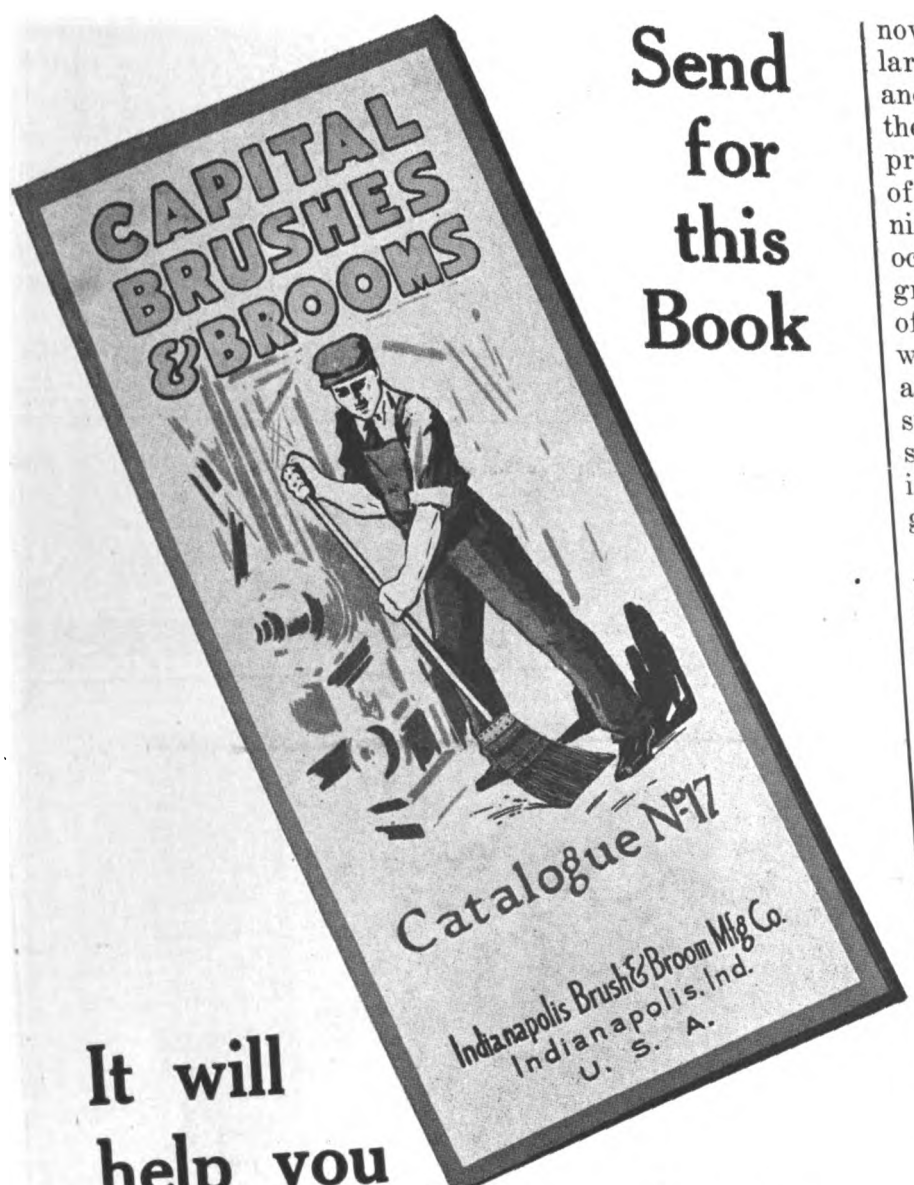


Races displaced to show DEEP-GROOVE bearing carrying maximum end thrust in a forward direction.

Races displaced to show THE SAME bearing carrying maximum thrust in reverse direction.

BALL BEARINGS
The Highest Expression of the Bearing Principle

Digitized by Google



Send for this Book

It will help you Cut Cleaning Costs

This booklet will be very valuable to purchasing agents and other executives who are interested in reducing cleaning costs in their factories. It illustrates and describes CAPITAL Industrial Brooms and Brushes, a line of highly specialized units that meets practically every industrial requirement in cleaning equipment. With this book as a reference, you can select a CAPITAL broom or brush that is built to do just the particular cleaning work that your manufacturing processes make necessary.

CAPITAL
Industrial Brooms and Brushes

Can be used in almost every industry to effect big savings in cleaning costs and to increase the efficiency and speed of cleaning methods.

Select From Catalog 17
Then order from your jobber

Practically every leading mill supply or hardware jobber in this country sells CAPITAL Brooms and Brushes. After you select the equipment that meets your needs, from Catalog 17, you can get prompt delivery from your jobber, who probably also is our local representative. Our jobbers sell to you on our positive guarantee of satisfaction, under which you can return any unsatisfactory goods for full credit, with carrying charges both ways paid by us.

Send for Catalog 17 Today—Use the Coupon

INDIANAPOLIS BRUSH & BROOM MFG. CO.
I. W. LEMAUX, President
130 Brush Street Indianapolis, Ind.

MAIL THIS COUPON

Indianapolis Brush & Broom Mfg. Co.,
130 Brush Street, Indianapolis, Ind.
Send us Catalog 17, and the name of your nearest jobber.

Name.....

Address.....

now recognized executive is largely the production of ideas and the managing of men in their execution. We are so prone to limit our conception of this function to its recognized channels that it seldom occurs to us that there is as great a field for the creation of ideas by the individual worker. That there is equally as much opportunity for his successful management of himself and the work under him in the part he plays in the great game.

Readily enough we admit that mountains are but the accumulation of minute grains of sand. How have we come to overlook, or at least failed to emphasize the obvious truth that a great job of management can only result from the accumulated successful efforts of an immense number of small managers? The individual in this mountain of accomplishment must contribute at least a fair bit of good management to his own efforts if the aggregate is to even approach soundness or completion.

When we fail to see these things, we are unconsciously furthering a continuance of the great economic disease that is today being made the subject of unlimited study, conference and discussion—the loss of production through waste. With it is a resulting lack of possible success that affects the ultimate income and the welfare of all of us. It causes all of us to be some poorer; a matter of concern for each of us.

Now there are two kinds of waste in industry: attendant, or inevitable waste; and preventable waste. The first comprises mostly physical material, like the chips from a carpenter's tool, or the cuttings from a piece of cloth made into a garment. These are the natural results of adapting new material to a finished product. There is a whole industry of manufacturers who make machines and devise methods for the use of such wastes; whole laboratories whose sole aim is to turn these tailings from the mines of industrial activity into usable by-products.

The waste with which we have to do, and which is our real concern, is largely one of ineffectiveness of endeavor—the material, time and energy lost beyond recovery because of a thousand inperfections in the methods of control and execution of our work. Hence, it is a man-made waste. It is largely a matter of efficiency; of our failure to register our highest possible percentage in all of our endeavors. With the resulting fact, that only through working upon men can any lasting remedy be found.

There is a growing literature upon this waste and the things people do to cause it. Management is charged directly with the responsibility of the greater portion—from fifty to eighty-odd per cent. But seldom a word is written as to why managers mismanage, or what to do with that why.

One of the most exhaustive and complete attempts in these studies is the recently printed report made by a group of the country's foremost engineers, entitled "Waste in Industry." It is such a marvel of thoroness and exactness as will insure its use for some time to come as a standard of reference. There is an amazing list of holes in the walls of productive efficiency, nearly all of which are matters of loss of production from faulty management of materials, plant, equipment, and men. Curative remedies in kind are called for through the betterment of each of the avenues of failure—but there is hardly a word of better men. The need of better thinkers is doubtless meant to be implied; for there is plenty about wastes, and plenty about the lack of control which rightly is the immediate cause. But there is no effort to go behind the scenes, and seek for the causes of the cause! The remedies to be applied are well conceived, and would achieve in themselves a world of benefit—as far as they go. The mere application of them could be at best but a palliative.

Suppose we do plug up all the sources of preventable waste—who is going to stay on the job to keep them plugged up? Granting their existence through the lack of proper management, will not the same condition of mental attitude and temperament which now permit their existence, eventually permit the same or equivalent wastes? It is admittedly a question of proper management—but what of the man-

(*Continued on page 64*)

Digitized by Google

ROBINS

20 ft. Portable

$433.00



The above price is without power, F. O. B. Passaic, N. J.

If furnished with 2 H. P., A. C. Motor—$94 additional. With 5 H. P. "New-Way" Gasoline Engine—$175 additional.

This conveyor with its troughed belt and absence of skirtboards makes it possible to handle Coal, Coke, Sand, Gravel, Crushed Stone, and other abrasive materials without damage to the edges of the belt.

Note these features:

16" Troughed Belt—large carrying capacity. Self-cleaning arched frame—fully protecting the return belt from dirt accumulation.

Rugged construction—well balanced. Capacity of one ton per minute.

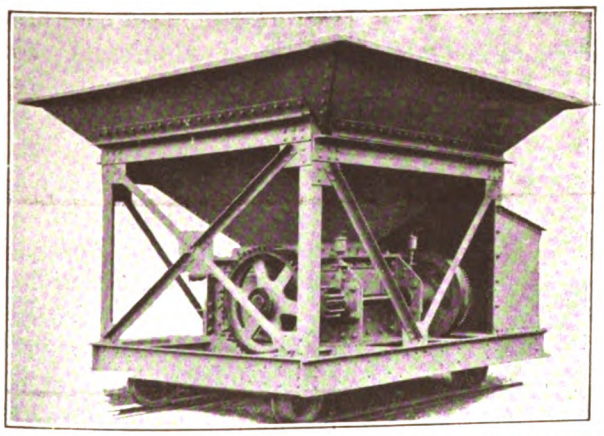
At the low price it is now being offered, no industrial plant can afford to overlook its time and money saving qualities.

Send for bulletin giving full specifications, or better still place your order for one now.

Robins Conveying Belt Co.

New York Chicago Pittsburgh Boston

"PENNSYLVANIA" ARMORFRAME SINGLE ROLL COAL CRUSHER.



In a recent Paper Mill installation, the "Pennsylvania" ARMORFRAME mounted on a Steel car receives the coal in its Steel Hopper direct from the storage pile by means of locomotive grabbucket Crane. The car runs on the Power House roof and delivers the coal to the stoker hoppers by gravity. The Crusher is motor driven.

This is the simplest method of coal handling and uniform preparation where local conditions permit its use.

Tramp Iron has no terrors for the "Pennsylvania" ARMORFRAME with its massive steel construction and Triple Tramp Iron Protection.

"Pennsylvania" Coal Preparation Machinery includes Bradford Breakers for crushing, cleaning and sizing large tonnages at Mines, Gas Works and Central Stations; "Pennsylvania" Hammer Crushers for By-Product Coke Plants and Stations; "Pennsylvania" Hammer Crushers for Mines preliminary to pulverizing, and "Pennsylvania" ARMORFRAMES for Mines and Industrial Power Plants.

Outline your problems when sending for Coal Preparation Bulletin No. 6001.

PENNSYLVANIA CRUSHER COMPANY

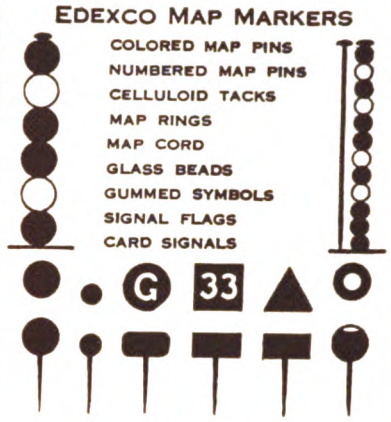
1320-1325 Stephen Girard Bldg.
PHILADELPHIA, PA.

GRAPHICS WILL TELL

This check list of supplies will help you

EDEXCO GRAPHIC RECORD SUPPLIES

EDEXCO MAP MARKERS



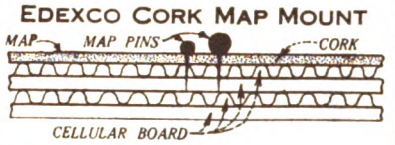
COLORED MAP PINS
NUMBERED MAP PINS
CELLULOID TACKS
MAP RINGS
MAP CORD
GLASS BEADS
GUMMED SYMBOLS
SIGNAL FLAGS
CARD SIGNALS

EDEXCO OUTLINE MAPS



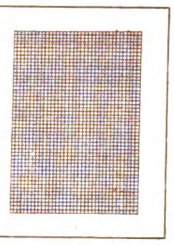
STATES
UNITED STATES
COUNTIES, R. R. & TOWN CITIES OF 25M
WORLD

EDEXCO CORK MAP MOUNT



SWINGING LEAF FIXTURES

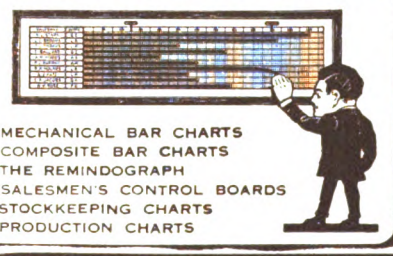
EDEXCO CHARTING PAPERS



LARGE SIZE
LETTER SHEET SIZE
LOGARITHMIC
ARITHILOG, SEMI-LOG
YEARBYDAYS
BARGRAPH
POCKET SIZE
COLORED CRAYONS

BOOKS ON GRAPHICS

EDEXCO MECHANICAL GRAPHS



MECHANICAL BAR CHARTS
COMPOSITE BAR CHARTS
THE REMINDOGRAPH
SALESMEN'S CONTROL BOARDS
STOCKKEEPING CHARTS
PRODUCTION CHARTS

EDUCATIONAL EXHIBITION COMPANY
527 Custom House St., Providence, R. I.

Send me details on items checked above.

Name ..... Title .....

Firm ..... St. & No. .....

City ..... State .....

Also here is $1.00 for the

EXPERIMENTAL SET

of map pins, charting paper, map mount, and descriptive literature.
Get this set and see how graphics might fit your own plans.

Digitized by Google

(*Continued from page 62*)

agers? What is going to make those now responsible for their departments, plants, policies, etc., suddenly become more efficient, more knowing, and more effective? What about the effectiveness of the thousands that carry out the ideas of the executive management, and which in the real analysis are the direct sponsors of these enormous wastes?

The problem for a more generally effective condition in business and industry is the task of getting every executor of work, from officer down to straw-bosses, each to see his task not only just in its relation to himself, but also in relation to his department; to see his department in relation to his organization; and his organization in relation to its industry, and all industry—in such degrees as we can. To get each man's viewpoint and horizon broadened. To get him in the eternal habit of looking for better ways of doing his own and the company's work is the real problem.

Efficiency experts can be employed to the betterment of an entire plant or organization. But even with charted and printed forms, and specified methods of procedure, there will be little continued gain over the first jump in improvement unless the efficiency people be held on the job—which would be prohibitively expensive. We can only evade this necessity of importing better thinkers by teaching the existing force to be its own efficiency guides.

Unfortunately, these things cannot be legislated into our forces any more than morality or economic betterment can be impressed upon a community by the passage of any number of enabling laws. It will do no good for boards of directors or officers to agree that more thinking must be done, better planning and better execution of work, unless they devise some means of making their workman teach themselves to do these things better. The simplest thing in the world—and just about the hardest.

Now our various mental abilities and total capacities for work may be likened in comparison to various sizes of cups, jugs, barrels, and even hogsheads. Some of us when we do our utmost have not accomplished more than a fraction of another's efforts who may be using but a fraction of his ability. It is in the job of increasing both of these things, the capacity for work, and the efficiency of work, that our real task lies. We must make the little cups of ability into bigger cups, little jugs into barrels and small barrels into bigger ones by increasing the horizon, the knowledge, and the judgment of all of our employees. At the same time we must get them into the habit of drawing at all times upon all the knowledge they have. We must increase their effectiveness through increased capacity, and through the use of a full vessel instead of just a portion of their jugs or barrels of ability.

There are already men of ability, naturally, who need no new stimulus to set them to thinking; who already do the historic right thing at the

(*Continued on page 66*)

"No Advance in Prices!"

ALTHOUGH the temptation and tendency to *raise* prices is today generally manifested we announce our decision to *stand pat!* Our volume of business during the past few months has increased enough so that our reduction in overhead practically equals the increase in cost of our material and labor. As the news of our low prices becomes widespread, we confidently expect this sales growth to hold up steadily. And just as long as this is true we will continue to sell our full line of Labor-Saving Products at *no increase in price to the buyer!*

Every ounce of metal or other material, every detail of construction and finish, every point of service will be maintained at that same high standard from which no circumstances can cause us to depart.

(We submit this "Glad News" in the face of an average rise of 15% in our Material Cost, *plus* 5% increase in our Cost of Labor.)

Confidence—
in the superior performance of Lewis-Shepard Products under severest competition; *Confidence,*—that holding prices at present levels will rapidly increase our sales; *Confidence,*—that continued low prices will profit our customer as well as ourselves.

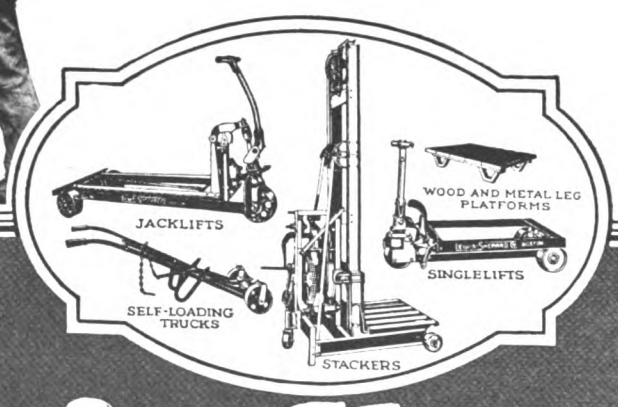
Satisfaction—
Over 4000 customers in past 8 years. 50% New Business from old customers. *We Guarantee Results from our Equipment before You Pay.*

Lewis-Shepard
Handling Equipment
— saves manpower and money

Send for free Illustrated booklet

"24 *Users Increase Profits* $59,565.88 *Yearly*"

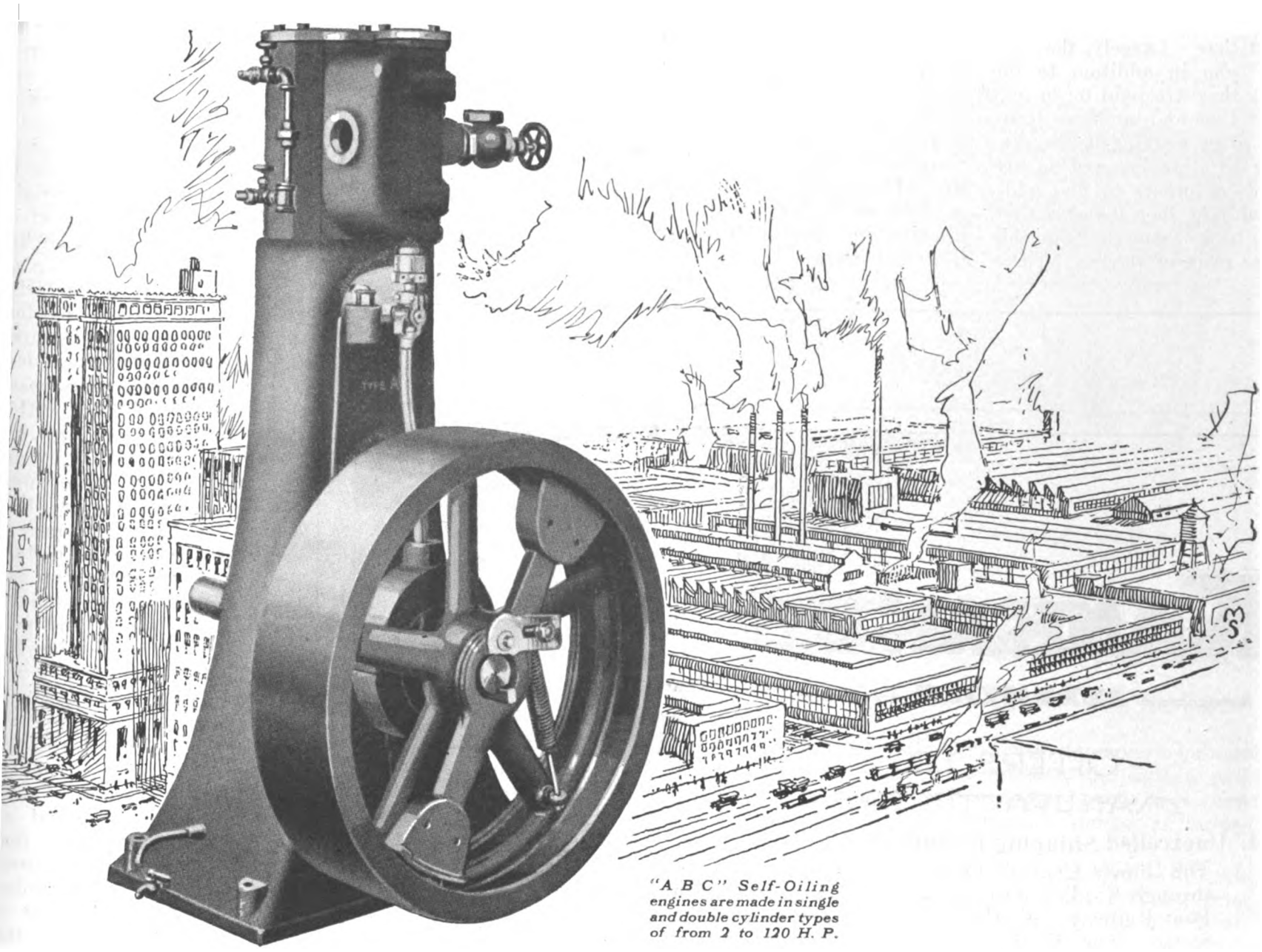




Write us today at our factory address
Lewis-Shepard Co.
582 E. First St.,
Boston, Mass.

Lewis-Shepard
BOSTON

Digitized by Google



"A B C" Self-Oiling engines are made in single and double cylinder types of from 2 to 120 H. P.

This Sturdy Engine Gives Unfailing Power For Months Without Attention

It is hard to realize that any steam engine could endure day-and-night operation—seven days a week—for ten, fifteen and even twenty years. Yet such instances are not uncommon in the case of "A B C" Self-Oiling engines.

These remarkable power units are designed especially for the operation of blower fans, mechanical draft apparatus, lighting plants and other uses where stops are days or weeks apart. Ample lubrication under all conditions, rugged construction and high efficiency make the "A B C" engine one of those rare pieces of equipment that you can install and then almost forget.

Write for details of construction and startling testimonials of its wonderful performance.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO (277)

American Blower

"Sirocco" TRADE MARK

EXHAUSTERS · VENTILATING FANS · AIR WASHERS · BLOWERS · ENGINES
FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

Digitized by Google

(Continued from Page 64)

right time. Largely, they are men who in addition to the work they are paid to do, put much time and intensive study into after working hours, digging in libraries and in the works of others to find additional light upon the work they have to do tomorrow; for this is the price of success. These are men who may be called self-starters; who do these things of their own accord because they are happier thus, or because they can see no other way of making tomorrow's work better than today's. No way of bringing real thought to the task of today except by illumination from outside of their own work.

There are many of these get-there folk; but there are not nearly enough of them. The great question is how to make more of them.

Leading thinkers, in analyzing influences on human endeavor, are placing less and less emphasis upon heredity, or transmissible traits, and are recognizing that environment is the great factor in determining the characteristics and trends that govern a given person's final aptitudes and ability, and their expression. In other words, even though industry and business cannot get its human material in its infancy, and must of necessity take it long after many of its developing influences have had their first and strongest play, it is still largely raw material. It can actually be molded into desired shapes. Not, of course, indiscriminately. One does not expect lumber to be made into cutting tools, nor cotton fibre into steel cables; but they each have highly special and valuable uses in their own fields. If we recognize that our human material comes to us already classified as certain types of raw material, we can still work each kind into its maximum of utility and performance in the direction for which it is best suited.

There are many, in all organizations, of recognized importance to which these things apply in part. But for each of these there are dozens of relative unimportance except as assistants, detailers, or just plain workers. These form the territory largely regarded as barren of thought, that is to be cultivated—this is the clover that we are trampling underfoot through neglect.

The trend of the day is towards such a degree of specialization in business, that from the petty jobs to the big ones there is almost no such thing as an all-round man. We grow in chosen, perhaps, but well defined channels of work. Once we get launched, we are pretty well shut off from the views and influences of other lines. Yet, in a given business, though there may be a dozen different lines of activities—from buying and manufacturing, to accounting, advertising and selling—they all have a close relation, and are interdependent. They are all about the same thing, and are driving towards the same end. To be really creative in mind, one must know at least a little something of the bearing which many of these varied lines have upon one's own work. We should realize that none of them is enough isolated to permit a knowledge of it alone to be all that is necessary for its

(Continued on page 68)



ROTHSFORD NEEDLE WORKS, ROTHSFORD, PA.



- OFFERS TO MANUFACTURERS -

1. Unexcelled Shipping Facilities

The Illinois Central Railroad runs from Chicago through Kankakee to the Gulf of Mexico. The Big Four Railway taps the principal gateways to the South. The Kankakee Belt Route (the Illinois Division of the New York Central) is the connecting link between Eastern, Western, Northern and Southern Railroads. An interurban road also connects Kankakee with Chicago.

2. Chicago Freight Rates

Kankakee is a Chicago Rate Basing Point.

3. An Abundant Supply of Contented American Labor

Kankakee's population is 88% native white. Kankakee is an Open Shop Town—strikes or labor disputes have never occurred in Kankakee.

4. Natural Resources and All Modern Utilities

Coal is mined within 25 miles of Kankakee. Power is supplied by the Kankakee river. Public Utilities are supplied by the great Public Utilities Companies in Chicago.

5 An Economically Sound Community

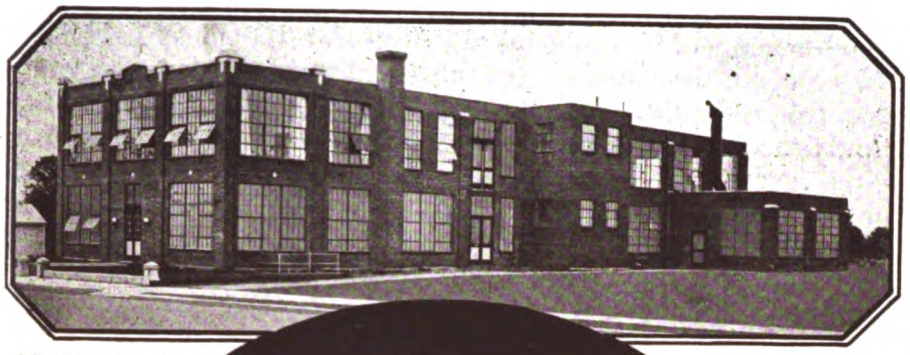
Chicago is 54 miles from Kankakee. Therefore, the market for finished products is but 90 minutes distant.

Why not move your plant to Kankakee?

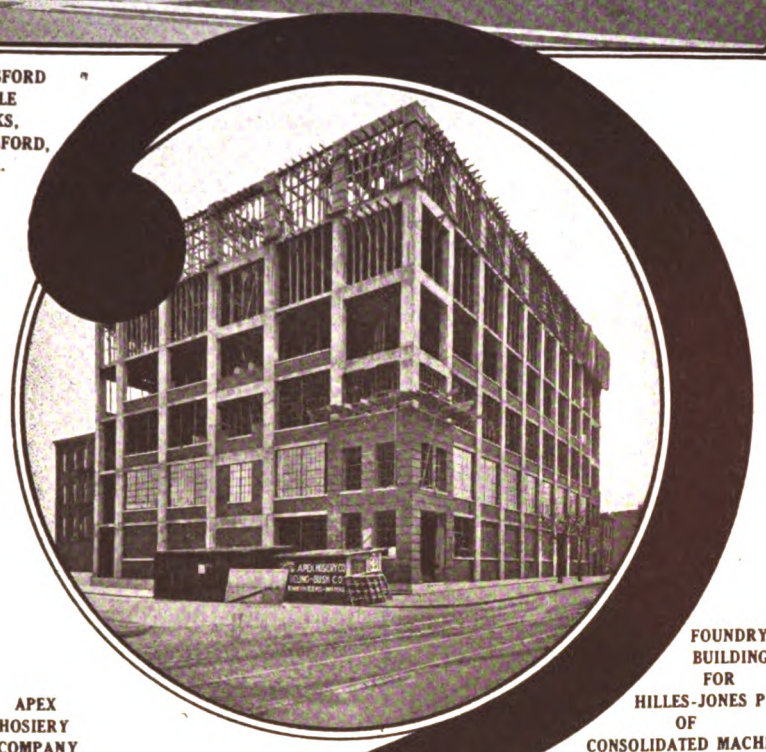
For further information address

J. N. SLETTEN, *Secretary*
Kankakee Chamber of Commerce
Kankakee, Illinois

Digitized by Google

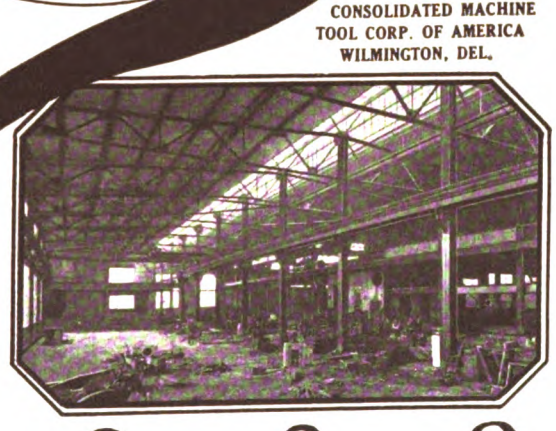


ROYERSFORD NEEDLE WORKS, ROYERSFORD, PA.



APEX HOSIERY COMPANY PHILA., PA.

FOUNDRY BUILDING FOR HILLES-JONES PLANT OF CONSOLIDATED MACHINE TOOL CORP. OF AMERICA WILMINGTON, DEL.



? ? ? ? ?

If there is any question

in your mind about our standardized construction being applicable to your problem, we invite you to study the wide range covered by the three types shown above, recently erected by us.

30, 60 and 90 day Deliveries.

And substantial savings besides.

Write for information.

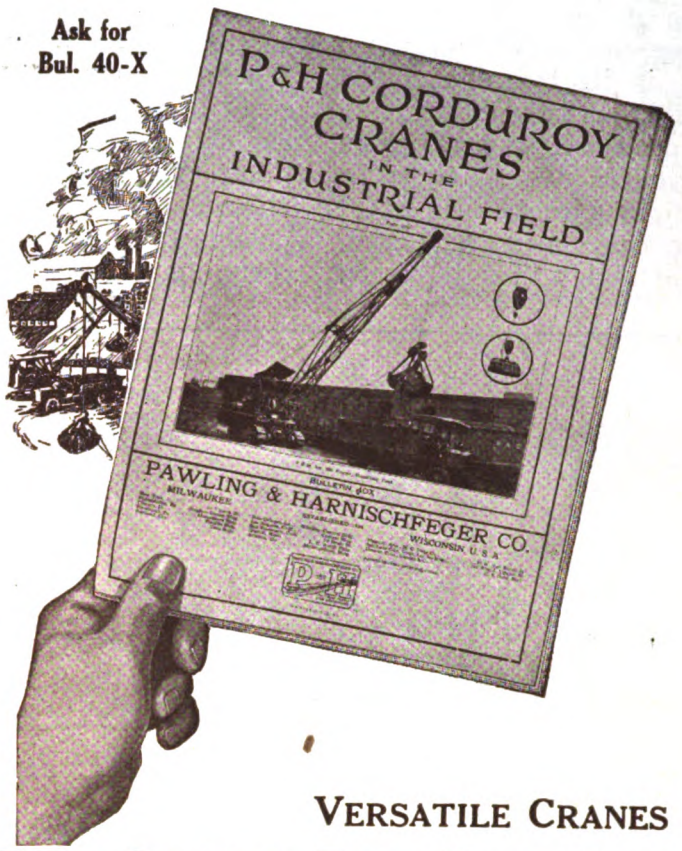
THE BELING-BUSH CO., INC.

Factory Engineers and Builders

THE

Drexel Building SERVICE **Philadelphia, Pa.**

Ask for Bul. 40-X



VERSATILE CRANES THAT QUICKLY EARN THEIR COST

The quick handling, the easy maneuvering about from one location to another, the economy of operation of P & H Corduroy Cranes have been recognized by an increasing number of industrial plants.

In loading and unloading materials with hook and chains, grab bucket, lifting magnet, time and money are saved. *One* man controls all motions of this full-revolving portable crane, moving anywhere on its corduroy traction.

Being driven by gasoline or electric motor the starting and stopping is the work of a moment. No lost time, no fuel or current used except when the crane is in use.

With comparatively short boom, this Crane handles materials fast—it may be moved to either end or either side of cars or stock piles and with operating area unrestricted it does the work of heavier, more expensive cranes (operating on tracks) at lower cost.

The P & H Corduroy Crane is also used with shovel boom or pile driving rig when new plants or extensions are built. It is also used to erect structural steel and for the installation of machinery. In this way the P & H can wipe out a large part of all of its cost long before production starts.

The design and manufacture is of the same quality as is found in P & H Overhead Traveling Cranes and Hoists.

PAWLING & HARNISCHFEGER CO.

Established in 1884

38 National Ave., Milwaukee, Wis.
Offices & Agents In Principal Cities

Tear off this reminder

Pawling and Harnischfeger Co.,
Milwaukee, Wis.,

Send copy of Bulletin 40-x on P & H Corduroy Cranes to

(Name)

(Address)

(City & State)

P&H **CORDUROY CRANES**

Digitized by Google

(*Continued from page 66*)

successful operation.

One of the country's greatest personal service organizations, in its last annual conference, actually brought up this phase of the development of constructive imagination, questioning whether in an organization consisting essentially of highly trained experts, sufficient of an all-round viewpoint could be attained to make really constructive thought possible in its highest sense. Whether an over-all viewpoint could be applied to the problem of the client that, in addition to the technical points involved, would take on all the outside factors of production, costs, marketing, etc., that makes many of its problems almost one of economics. As far as can be gathered from the published report of that meeting, everybody admitted the advantage and necessity of such points of view. There was no apparent recognition of the fact that the solution of the problem lay right in the hands of the men at that meeting—for the most part dir... tors, and branch managers... the company. They did not s... that if such a thing as an ov... all constructive viewpoi... were to be assured among ... personnel, it would have to ... developed—and could be d... veloped. But not without ... thought, time and energy ... those very men. They seem... to overlook the possibility ... developing something that w... worth inestimably more tha... a matter of mere academ... discussion.

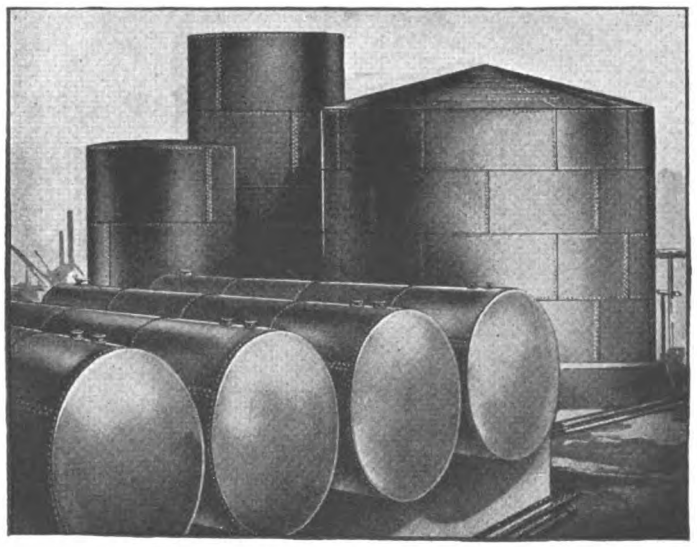
Now it is these very annua... conferences, or their equiv... lents, that at present often a... futile in their results, that ... can use to help us in the p... we are after. There is usual... such little effort made to d... velop the instinct for analy... and mental receptiveness, tha... it is almost a natural conditio... to find that conferences goo... in content pass over the head... of many of these who come a... delegates. Too often the dele... gate is made too much a vi... itor, and too little a partic... pant—too much a listener, and... too little a conferer.

Often the prospect of the annual conference, as the time approaches, is looked upo... with varying degrees of appr... hension, downright fear, antic... pation of a jolly good time... tolerance, and even ridicule... I have seldom seen a ma... eager to go to one in the con... fidence of getting his trouble... solved, and of coming back... primed with regular bare... handed information that would... give him working ideas and... methods and opportunities for... realizing his expected expan... sion in the following year's... business. As a rule, the pro... grams of these meetings are s... lined up as to make the whole... proposition partake of the na... ture of a social atmosphere... The entertainment of the visi... tors is looked after as a fun... tion of the primest importance... There are usually group meet... ings of various classes of work... ers, at which the head of the de... partment or phase of the bus... ness generally gives a resum... of what has been done during... the preceding year. Frequently... he jumps in with a smashing... drive of criticism, and then... outlines what is hoped to be... accomplished during the next... year, occasionally with definite... plans, but more often with just... the expression of a hope and...

TANKS

LANCASTER

STEEL PLATE CONSTRUCTION



LANCASTER PRODUCTS

TANKS

ACID STORAGE
BLOW OFF
COMPRESSED AIR
FILTER
GASOLINE STORAGE
HYDRO PNEUMATIC
JACKETED
MIXING
MOLASSES STORAGE
OIL STORAGE
PRESSURE
SETTLING
VACUUM
WATER SOFTENER
WATER STORAGE
STEEL PLATE CONSTRUCTION

SPECIALTIES

OIL BURNERS
HEAT TREATING FURNACES
CLAY WORKING MACHINERY
CASTINGS—IRON & SEMI-STEEL
CONDENSERS
DIGESTORS
DREDGE PIPE, Y'S, GATE VALVES
EVAPORATING PANS
GAS AND HYDRAULIC MAINS
HOPPERS
RIVETED PIPE
ROTARY DRYERS
STACKS & BREECHINGS
Built and Erected
LARGE STORAGE TANKS
Built and Erected

Plate Shop, Machine Shop, Foundry and Pattern Shop All Included in One Complete Plant

SERVICE has always been the major aim in building Lancaster Tanks. Users of Tanks recognize this value—know that Lancaster Tanks *will* deliver service.

There are no short cuts in designing and building Lancaster Tanks. The materials in every instance must be right in quality, weight and gauge; every plate must be riveted or welded with the greatest skill and attention. At every stage of production, inspections and tests must be made so that when completed, the result is a safe, durable, non-leaking Tank. These are some of the inbuilt factors that make Lancaster Tanks worthy of the favored name they have.

Let our Engineers cooperate with you on selecting the right Tank for your particular purpose.

LANCASTER IRON WORKS, INC.
LANCASTER, PA.

501 Fifth Avenue
New York

Wesley Building
Philadelphia

Our Service Department has compiled three books of practical value to users of Ta... OOK J-1, Prices and Specifications 303 sizes Hor... Tanks, 100 to 25,000 Gallons. BOOK J... s from 1,000 to 74,000 Barrels. BOOK J... fications of 134 Standard Sizes Pressure ... of these books sent free upon reques...

Digitized by Google

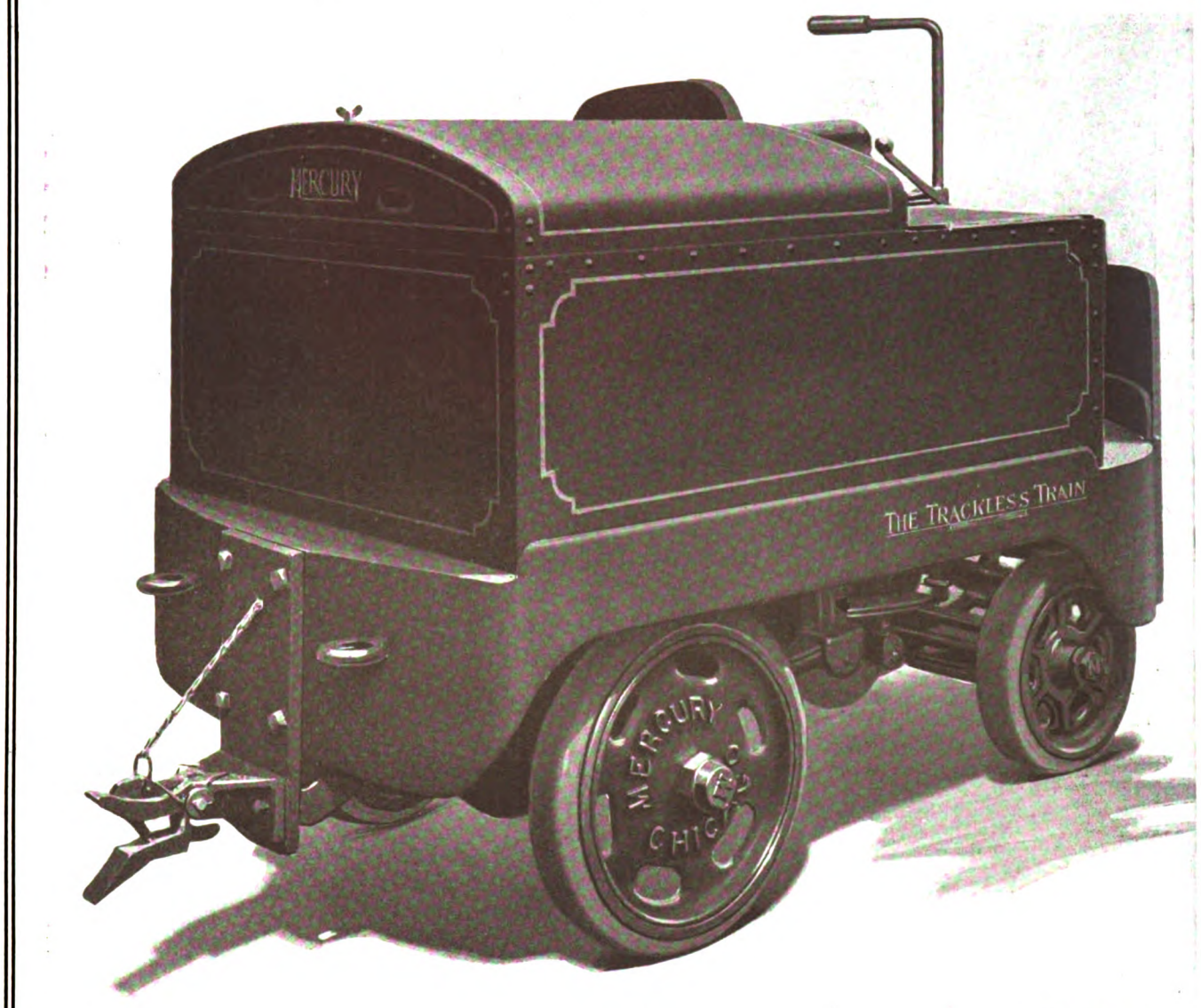
the positive expectation of results. Then toward the end of the whole program, about the third day, there is a large banquet. The inspirational dope is passed out in great gobs for digestion and application—from calls for greater efficiency at less cost, to vivid pictures of possible accomplishment. All of which is supposed to be the momentum necessary to carry the machine through the next year. And the machines *do* go through the next year, a good many times with bigger business and more profit—but get out our indictments of industry again, look at the unplugged holes, and visualize the might-have-been.

I am more and more of the opinion that as now constituted, the great majority of these annual conferences, drawing men from widely scattered territories, at best but take advantage of a small part of their opportunities. That in the main, they represent in themselves a large economic waste both in time and expense. The whole thing is too much a product of the moment when the full year intervening should be used in its preparation. There is too little effort made to develop in the individual the habit of looking today at his work and the work of others and the company's work with next year's conference in mind. With the result that we have not so much conferences, as an occasion for the detailing of the already formulated policies of the directorate—plus the opportunity of pepping-up the executives who are to carry out those policies.

Suppose now that every year, including such of the shop forces as is seen fit, every person in the organization from bottom to top were required to write out as best he could the answers to some such questions as would involve his opinion as to the productivity of his own methods of work, those of his department, or related departments, and of the company as a whole. Opinions both suggestive and critical. Suppose that these opinions were summarized, not picked—for even the apparently inconsequential ones might loom big under discussion— and the grand result of these be made the basis of the annual conference. What do you suppose the result would be? Drivel? Perhaps. But it would not be entirely the fault of the drivelers!

When, as in these times is being quite generally done, the heads of an organization call upon its entire personnel for intensive coöperation,—for the keeping down of expenses, for the turning out of a maximum of work per man, and for a readiness to tackle any kind of job and see it through without additional outside help—they ask for a harder application to work and a steadier grind per man, that the organization as a whole may prosper. But they go on only part of the way in getting that coöperation. They call largely upon the physical side of the individual. They leave unplumbed what might be an immense mental resource in the sum of the ideas of each member of the organization who might express the results of his viewpoint from the outlook and contacts he has, upon the methods that if employed the

(*Continued on page 72*)



MERCURY TYPE M-4

A TRACTOR POSSESSED OF EVERY ATTRIBUTE ESSENTIAL FOR SATISFACTORY HEAVY DUTY SERVICE

POWER—To deliver a draw bar pull of 1600 pounds for normal service. Capable of developing 2100 pounds ultimate.

EFFICIENCY—Battery, motor and drive exactly co-ordinated to produce the maximum useful work.

RUGGEDNESS—To withstand the overloads and abuse to which a heavy duty tractor is subjected.

SIMPLICITY—That makes for economy in maintenance and ease of operation.

The M-4 heavy duty tractor is one of the FIVE Mercury types.

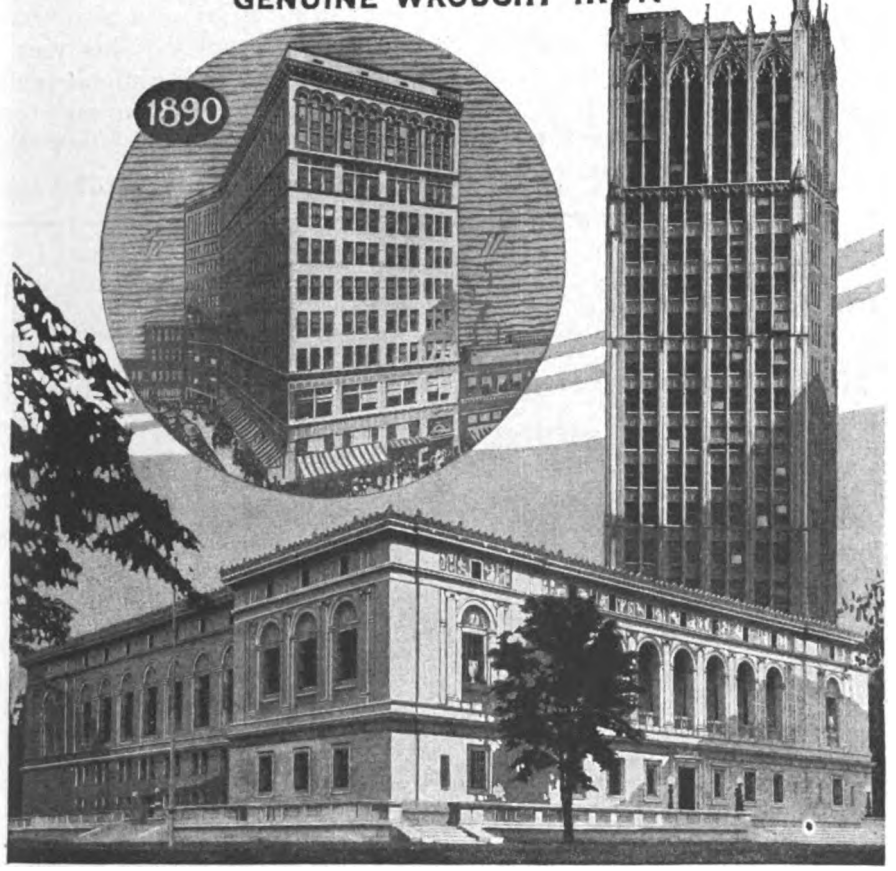
MERCURY MANUFACTURING COMPANY, CHICAGO, U. S. A.

THE TRACKLESS TRAIN

Digitized by Google

BYERS PIPE

GENUINE WROUGHT IRON



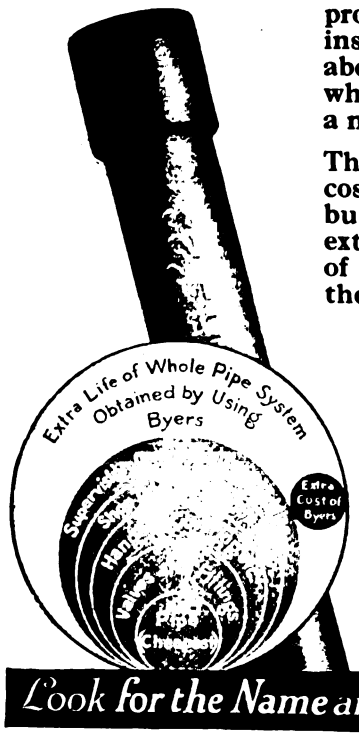
1. *Old Garfield Bldg., Cleveland, Ohio. Erected 1890. Byers pipe in heating system.*
2. *New Public Library, Detroit, Mich. Architect: Charles Gilbert, New York City. Byers pipe installed for plumbing and heating.*
3. *New Real Estate Bldg., Detroit, Mich. Architect: Louis Kamper, Detroit. Byers pipe installed throughout.*

Father Time Passes Judgment

THE rust-resistance of a metal cannot be pre-determined by laboratory tests. Only the test of time and service is decisive. So the metallurgist stands aside, waiting for the verdict of Father Time.

The Garfield Building, Cleveland, erected 1890, shown in circle above, furnishes an example of the long life of Byers pipe which is duplicated wherever Byers was installed years ago. The builders of today, profiting by this knowledge, specify and insist on the installation of Byers pipe above or underground, indoors or out, where the greatest durability is desired at a moderate cost.

The diagram shows the average items of cost in a pipe system. The pipe itself is but a small part of the total cost, and the extra cost of Byers pipe is but 5 or 10% of the total cost of the pipe system. Yet the life of the system depends almost entirely on the rust-resistance of the pipe. For when the pipe fails, the entire investment is lost, and more.



Send for Byers Bulletin No. 38 "The Installation Cost of Pipe," containing cost analyses of a variety of plumbing, heating, and power piping systems.

A. M. BYERS COMPANY

Pittsburgh, Pa. Established 1864

New York Philadelphia Boston Cleveland Chicago Houston

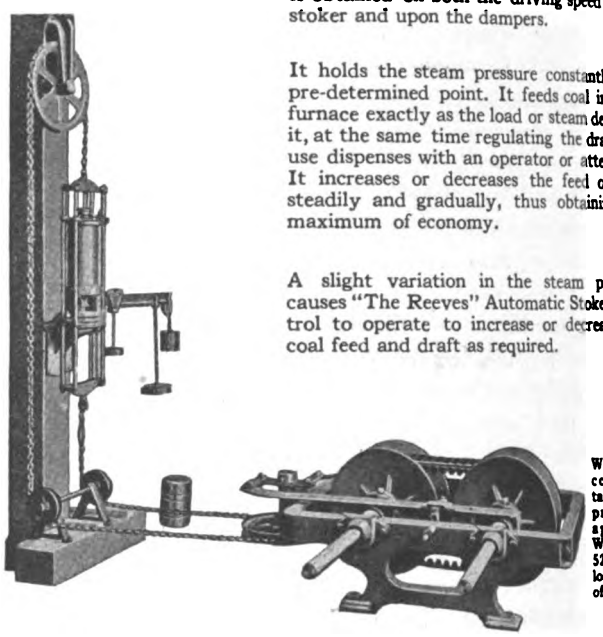
Distributors in all jobbing centers

Look for the Name and Year rolled in every

AUTOMATIC REGULATION OF BOTH STOKER FEED AND DRAFT

"The Reeves" AUTOMATIC STOKER CONTROL

is a complete innovation in stoker drives. Through it an entirely automatic regulation is obtained on both the driving speed of the stoker and upon the dampers.



It holds the steam pressure constantly at a pre-determined point. It feeds coal into the furnace exactly as the load or steam demands it, at the same time regulating the draft. Its use dispenses with an operator or attendant. It increases or decreases the feed of coal steadily and gradually, thus obtaining the maximum of economy.

A slight variation in the steam pressure causes "The Reeves" Automatic Stoker Control to operate to increase or decrease the coal feed and draft as required.

We will furnish complete details and blueprints upon application. Write for our 52-page catalog L-44 just off the press.

REEVES PULLEY COMPANY

COLUMBUS, Indiana

Just Suppose--

You had coming to you every month a big bunch of Pictured Progress such as you see in this copy of

INDUSTRY ILLUSTRATED

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name .....

Mailing Address .....

Company .....

Position .....

(Important confidential information—for our own records only)

ANNUAL SUBSCRIPTION $1

In Canada, $1.25; Foreign, $1.50

Digitized by Google

E V I D E N C E

EXPERIENCE is being purchased every day by progressive concerns. Utilizing the experience of others has saved thousands of dollars of expense to shrewd executives who are willing to install in their organizations methods and equipment found efficient and economical by others. Can you afford to ignore such evidence as is presented that

TOWMOTORS

are the most efficient and the cheapest per hour of operation haulage equipment that you can buy?

With such firms as these, **TOWMOTORS** as time and money savers are practically indispensable:

The National Malleable Castings Co., Cleveland, Ohio
Chase Metal Works, Waterbury, Conn.
The Rail Joint Co., Troy, N. Y.
The Wilmington Compress & Warehouse Co., Inc., Wilmington, N. C.
Appalachian Corporation, New Orleans, La.
Chas. F. Felin & Co., Inc., Philadelphia, Pa.
Merritt Lumber Yards, Inc., Reading, Pa.
Norfolk Warehouse Corporation, Norfolk, Va.
The Peerless Motor Car Co., Cleveland Ohio
The Chandler Motor Car Co., Cleveland, Ohio
The Cleveland & Buffalo Transit Co., Cleveland, Ohio
The Newton Steel Co., Newton Falls, Ohio
Henry Disston & Sons, Inc., Philadelphia, Pa.
American Dock Company, New York, N. Y.
The Cutler Hammer Mfg. Co., Milwaukee, Wis.
The Draper Manufacturing Co., Cleveland, Ohio
Rock Island Sash & Door Works, Rock Island, Ill.
Ball Brothers Glass Mfg. Co., Muncie, Ind.
The Mechanical Rubber Co., Cleveland, Ohio
American Steel & Wire Co., Cleveland, Ohio
The Lorain Castings Co., Lorain, Ohio
Kurz Brothers Lumber Co., Chicago, Ill.
The Van Dorn Iron Works Co., Cleveland, Ohio
The Aluminum Co. of America, Massena, N. Y.
Stafford Mayer & Co., Ltd., Port Louis, Mauritius Island
Western Transport Company, Liverpool, England
Christian Fredriksen, Sydney, N. S. W., Australia
H. W. Johns-Manville, Inc., Waukegan, Ill.
Pouch Terminal, Inc., New York, N. Y.
Carnegie Steel Co., Painter Mills, Pittsburgh, Pa.
The Herbrand Co., Fremont, Ohio
The Ferro Machine & Foundry Co., Cleveland, Ohio
United Alloy Steel Co., Canton, Ohio
Endicott-Johnson Corporation, Endicott, N. Y.
Ludlum Steel Co., Watervliet, N. Y.

THE TOWMOTOR COMPANY

1226 East 152nd Street **Cleveland, Ohio**



THE TOWMOTOR

Digitized by Google

(Continued from page 69)

following year might help to make the various parts of the organization function better, and would help put the company farther ahead of the game.

One of our favorite pastimes, often indulged in, is to discuss and criticise the Boss and the administration among our fellow employees. Each of us always feel that we could do the whole danged job better if we could have a shot at it. That this is a mere human conceit, arising primarily from a restricted viewpoint and insufficient information, and is quite evident. At the same time this very common attribute possesses possibilities, and can be turned from something akin to a human failing, into an asset. I have heard salesmen, grousing among themselves, discuss peculiarities of the trade, and defects in the products they were selling, that would have solved many of the problems of their superiors had they but had this intimate viewpoint which was open to them, but overlooked as being valueless. Many employees, thinking and expressing themselves thus, *do* think, and their ideas could be made of value. The opportunity to express them would do much—even if it only set them right to find that they were wrong.

Naturally, at the first attempt to gather these ideas and suggestions the result might be quite discouraging. The more discouraging, the greater the index of mental inactivity among the employees, and the greater the result to be hoped for by attempting to cultivate this now unproductive field.

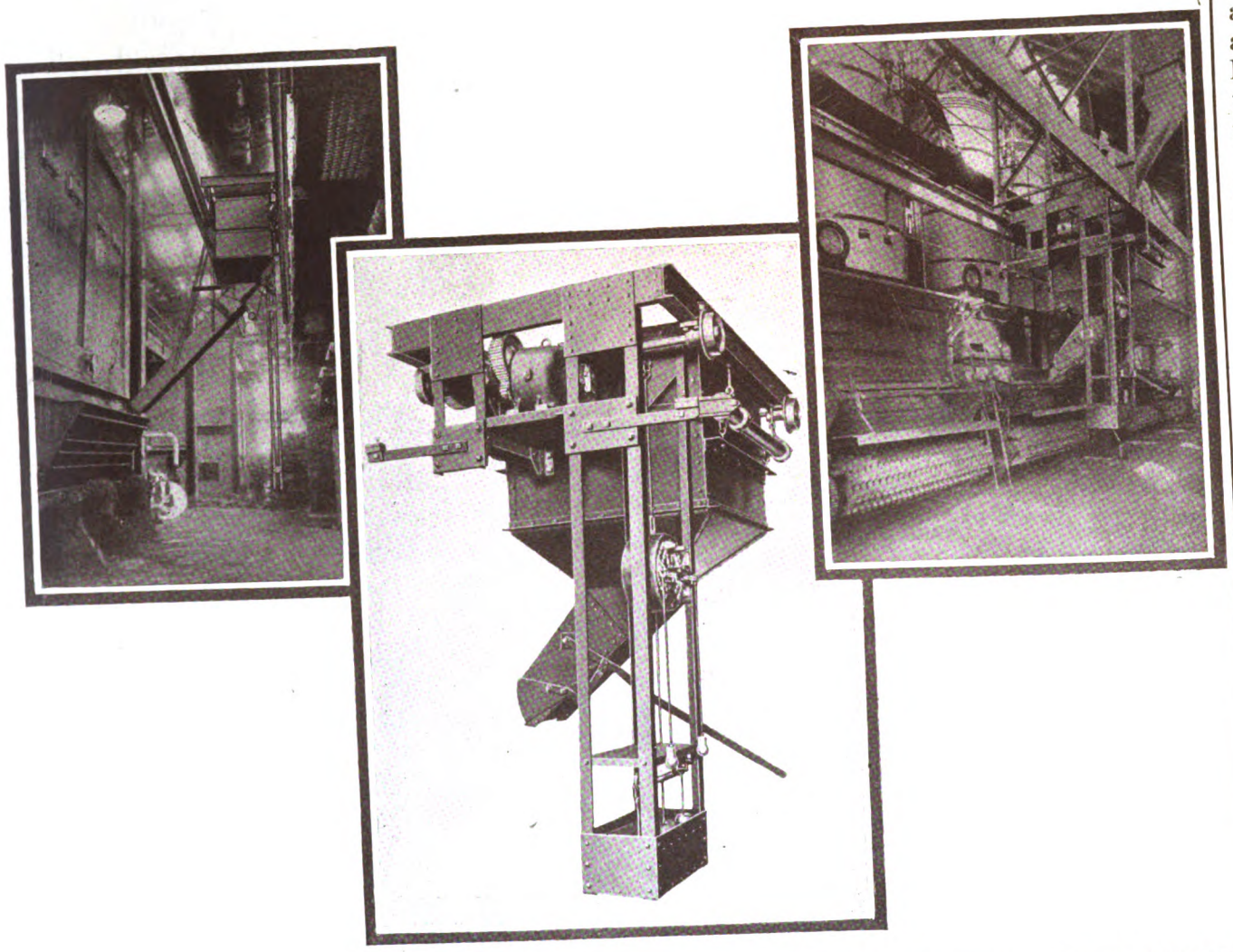
Frankly, the whole thing is a matter of cultivation. Even so substantial and small a thing as a pea will not grow without effort on our part—effort not only in planting, and tending, but even the new soil has to be first inoculated with cultures from previous leguminous bearing soils of the same plant bearing type before any result can be expected.

So it is with the minds we are letting lie idle while we are expecting them of their own accord to grow. A man is hired for the performance of a definite character of work—we overlook the fact that the work he does may be but a fraction of the work he is capable of doing, or would like to do. We let him do his work in his own way as only his own limited resources permit—with a little help he might do it a dozen times as well. We look upon the wastes he permits as faults to be corrected by the elimination of the wastes—we cure the effects and never seek the cause behind them all by attempting to train *his* mind to see all the possibilities of his job.

As with the average individual, this is no self-starting, general proposition. It calls for work that will never cease, any more than any other of the important functions of production will ever cease. It is something to be planned with skill, and perhaps cunning; it will cost time, money, and effort. But it would be the beginning of a new era in the efficiency of endeavor.

And why, after all, should not some money and time be spent in this quarter? There appears to be a huge unbal-

(Continued on page 74)



AN IMPORTANT LINK BETWEEN THE COAL BUNKER AND THE STOKER

A WEBSTER WEIGH LARRY in your boiler plant will enable you to keep an accurate dependable record of the amount of coal which passes from the coal bunkers to the stoker magazines.

Webster weigh larries can be installed in your power plant to serve any number of boilers as they are built either hand propelled or motor operated with capacities ranging from 500 to 5000 pounds.

Let our engineers analyze your coal and ash handling method to determine what improvements are possible and practical in your boiler plant.

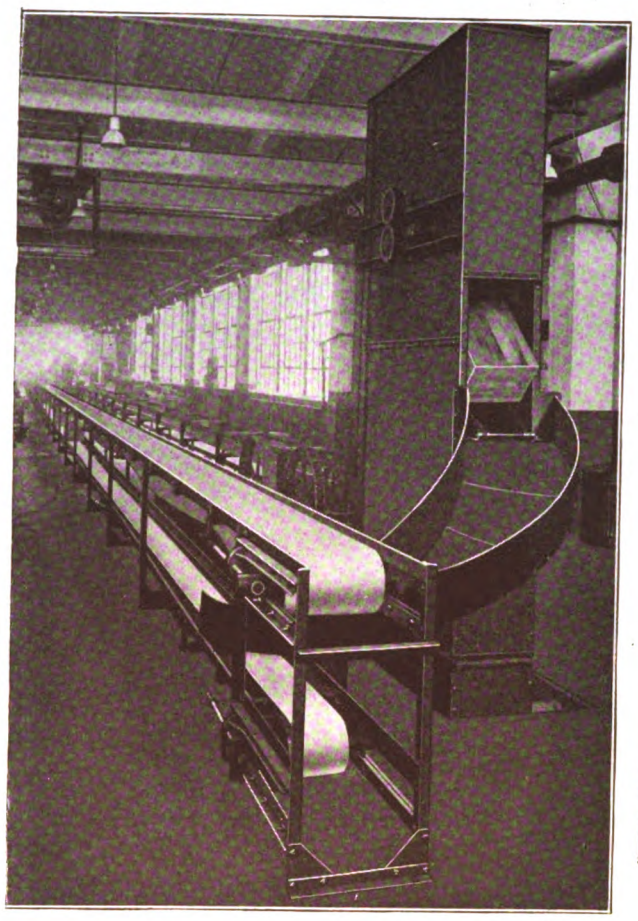
THE WEBSTER MFG. COMPANY

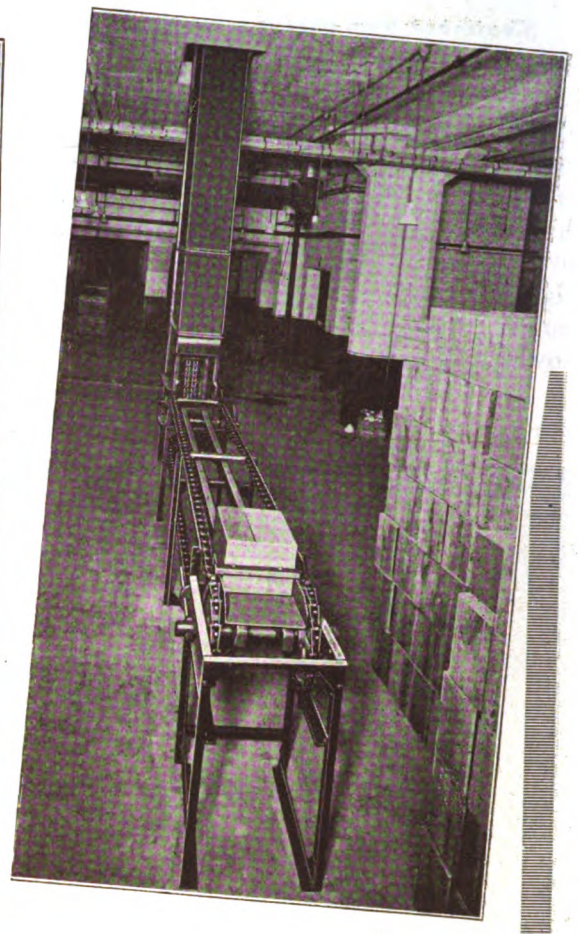
4500-4560 CORTLAND ST., CHICAGO

Factories Tiffin, O. *and* Chicago-Sales Offices *in* Principal Cities

Digitized by Google







Survey Your Plant Through The Eyes of Your Competitors.

SYSTEM immediately becomes the mooted question. True, productive machinery, such as machine shop equipment, mixers, looms, filling machines, etc., is practically standard. The equipment of this class that they have you have. But are you keeping your materials on the move so that all machines are producing constantly. That's the biggest factor of business today. And to keep products in the various stages of manufacture on the move you must use Conveying Systems.

Conveying Systems eliminate manual handling of materials, waste motion, keep operators supplied continuously with work, establish a working space for employees thereby controlling production and carry finished product to stock room or shipping department. *Just what would a Conveying System mean to your business?* A greater production with present payroll which means increased sales and more profits.

Conveying systems to function properly must be designed to meet your requirements. To determine your needs an analysis must be made of your methods of manufacture which involves study of operations, routing of materials, determining maximum production and the securing of necessary data from which a Conveying System which will keep materials on the move in your plant can be designed.

We will gladly have one of our representatives call so that this matter can be discussed to your entire satisfaction.

SAMUEL OLSON & CO.

Loose, Bulk and Packed MATERIAL HANDLING SYSTEMS

2418-26 Bloomingdale Ave.
CHICAGO, ILLINOIS

5th Ave. Bldg.
NEW YORK, N. Y.

Digitized by Google

(*Continued from page 66*)

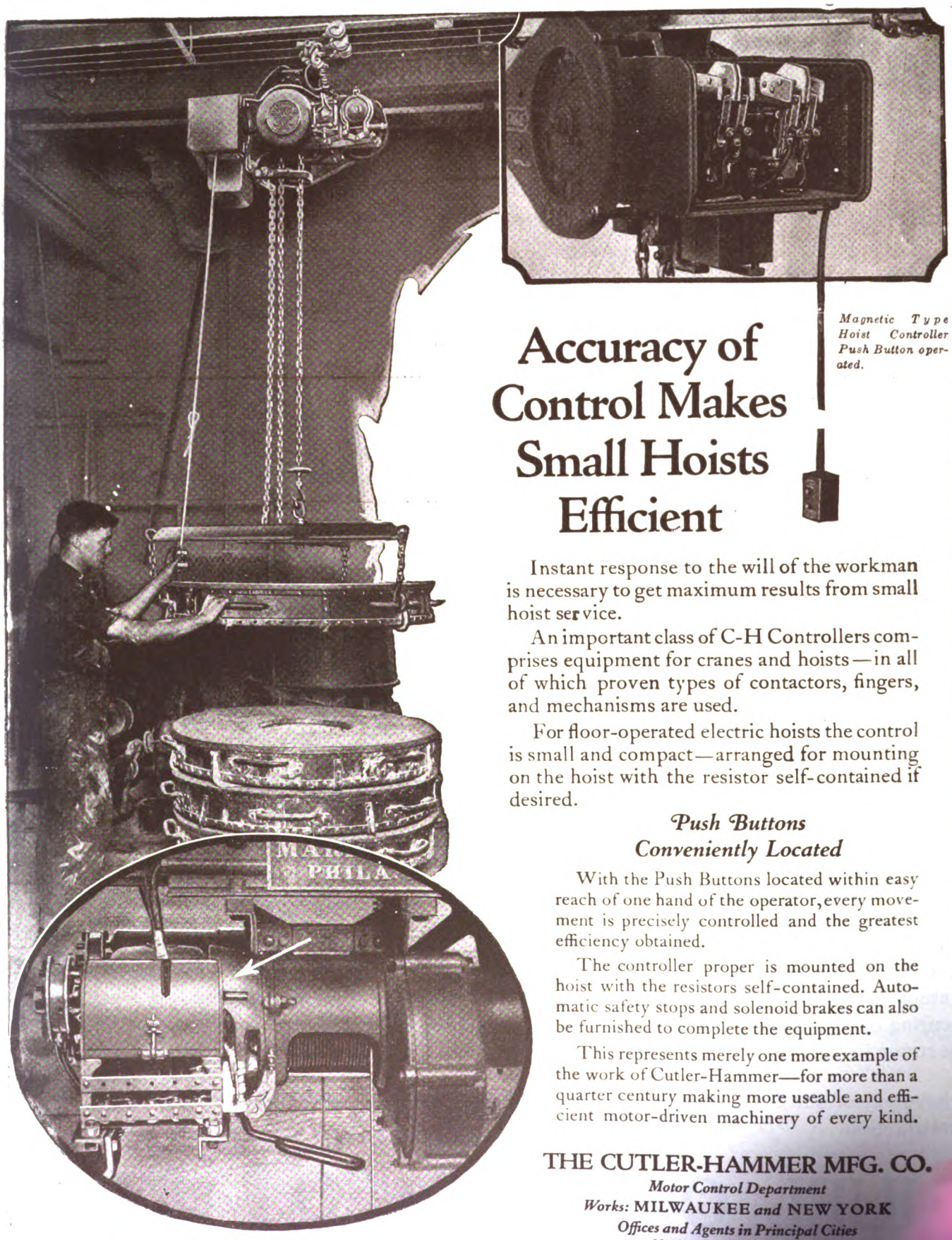
ance, somewhere, when the two extremes of an organization, the officers and the workmen, are the recipients of so much attention and benefits, while the in-between group, the actual executives if not the originators, gets only its minimum wage. Lockers and shower baths, schools and community houses, homes, hospitals, bonuses, and a horde of other extras seem to be ungrudgingly authorized for the workmen. Yet foremen, clerks, accountants, stenographers, junior and minor executives, and all other great army of white-collar workers have but their straight salaries to look to for both the extras and the necessities of life. Is it because the one class has been sorted into producers, and the other into that ogre, overhead, which permits the pampering of the one, and the apparent disregard of the other? If this be the reason, it is time they be given the opportunity, the means, and the incentive to improve themselves, and their jobs by the use of their generally so uncalled upon mental resources. Why wont the one expenditure be as profitable as the other? How many organizations encourage this middle group to prepare themselves for advancement? How many emphasize to their clerical and junior staffs that there is scarce a good sound man at the top of anything who has not spent much of his time in study and in preparing himself for larger opportunities? Of course they can find these things out for themselves. But how many are *made* to find them out—or rather made to *want* to find them out?

You district and general managers, officers and directors bewail the woeful lack of constructive thought, initiative, and judgment, crying, "Why don't they grow something besides sapheads, these days!" —not realizing that the "they" is *you* and that you have no more right to expect ability to spring full-clad into your executiveships than you have to hope that the tons of ore you haul into your plant as raw material will turn overnight into steel, and the next day into finished, operating machinery.

And now a little more as to methods.

We are to make some effort which will be equivalent in result to requiring that each of our employees—and *all* of them—submit once a year a written opinion touching briefly on criticisms of his own work, his departments, and that of the entire company, as he sees it; with suggestions on all three. These opinions will come forth reluctantly, at first, and with effort. They will even be largely useless, being, so to speak, half-baked. But the very knowledge during the course of the year of the necessity of rendering such opinions will engender a closer observation of all that goes on around each man. He will develop the habit of judging, weighing, and classifying as good or bad, every important act or policy observes, cultivating first alysis, and then judgment. these two qualities, particularly developed in connection with the peculiar work of company, will be an irresistible leaven. Each man

(*Continued on page 76*)



Magnetic Type Hoist Controller Push Button operated.

Accuracy of Control Makes Small Hoists Efficient

Instant response to the will of the workman is necessary to get maximum results from small hoist service.

An important class of C-H Controllers comprises equipment for cranes and hoists—in all of which proven types of contactors, fingers, and mechanisms are used.

For floor-operated electric hoists the control is small and compact—arranged for mounting on the hoist with the resistor self-contained if desired.

Push Buttons Conveniently Located

With the Push Buttons located within easy reach of one hand of the operator, every movement is precisely controlled and the greatest efficiency obtained.

The controller proper is mounted on the hoist with the resistors self-contained. Automatic safety stops and solenoid brakes can also be furnished to complete the equipment.

This represents merely one more example of the work of Cutler-Hammer—for more than a quarter century making more useable and efficient motor-driven machinery of every kind.

THE CUTLER-HAMMER MFG. CO.

Motor Control Department

Works: MILWAUKEE *and* NEW YORK

Offices and Agents in Principal Cities

Northern Electric Co., Ltd., Can.

Drum Type Hoist Controller, operated from floor by ropes.

C-H CUTLER-HAMMER **SMALL HOIST CONTR**

Digitized by Google

NILES CRANES



Save time—Save labor—Save space with modern crane equipment

THIS CAR MANUFACTURER wanted a crane to do double duty —inside and out—one which could be depended upon under all weather conditions. Quick, orderly transportation of trucks, car bodies and the many lighter parts that go into the assembly of a car was paramount. To fill these specifications Niles Cranes were chosen.

The years of satisfactory service since installation justify this choice.

For the Steel Mill Rolling Mill, Foundry, Shipyard, Quarry, Mine Yard, Locomotive Shop, Forge Shop, Central Station and wherever heavy materials must be handled with speed, safety and economy.

Niles Cranes are famous for their strength and reliability. They are made in sizes up to 250 tons capacity and larger. We also build Jib Cranes, Gantry Cranes, Wall Cranes. There is a right size and style for you no matter what your needs.

NILES-BEMENT-POND CO.

111 BROADWAY — NEW YORK CITY

CRANE WORKS— PHILADELPHIA, PA.

No. 1 *of a series illustrating the many industries served by Niles Cranes.*

BLU-EE

TRADE-MARK

For Your Windows—Means Better Work

Filters out the Heat and Glare



"Glaring light is a menace to the workers and retards production. The ideal light is a soft, cool light made by the sun's rays with the glare and heat cut out.

BLU-EE keeps out the rays below the blue line in the spectrum--rays that give the heat and glare to the sunlight. Those above the blue line penetrate unhindered and the result is a diffused, filtered light, restful to the eyes and gives the worker a chance to do better work.

BLU-EE is easily applied; simply dissolve in hot water, allow to cool and apply to the windows with a paint brush. It will not rub off but can be easily removed with warm water.

We want to prove what BLU-EE can do in your plant. Try some at our risk. Fill in the coupon below and send it in at once.

What BLU-EE Users Say

We wish to state that we are very much pleased with our use of "BLU-EE" and find that it eliminates the glare without the necessity of placing window shades.

BROWN-LIPE-CHAPIN CO., Syracuse, N. Y.

We use BLU-EE on our windows to minimize the sunlight, and it answers the purpose splendidly, without keeping out the breeze; whereas, awnings would cost considerably more and keep out the breeze.

AMERICAN SNUFF CO., Memphis, Tenn.

PARK CHEMICAL COMPANY

3822 Edwards Road **Cincinnati, Ohio**

Try It Out—We Run the Risk

PLEASE send me 2 packages of BLU-EE, sufficient to cover 2000 square feet of glass. It is understood that I am to use one of the packages as directed and will remit $5.00 for both if I am satisfied with BLU-EE, and if not entirely satisfied may return the other within thirty days and you will cancel this order.

Firm Name..... Position.....

Your Name..... Address.....



do one thing well

THE "New-Way" could not be sold within anywhere near its price, nor made of as high quality materials and workmanship if our immense factory and skilled corps of workers did not devote their entire time, energy and ability to producing but one type and size engine.

don't be misled

The "New-Way" is not to be compared with any other gasoline engine. For conveyors operating under very dusty and dirty conditions there is no engine or electric motor that is so well protected as the "New-Way." All wearing and moving parts are enclosed and operate in a bath of oil. Being throttle governed and Bosch Magneto equipped gives a steady flow of power, even better than an electric motor because it can be used anywhere and everywhere, whether electric current is available or not. Being air cooled it will operate continuously without overheating or freezing. It "Goes and Goes Right" in any climate.

If *you* have a power problem, let us help you work it out. It incurs no obligation on your part. A letter will bring our traveling engineer to your office.

Write for Circular C-23

THE "NEW-WAY" MOTOR COMPANY
LANSING, MICHIGAN, U.S.A.

Eastern and Export Office
Woolworth Building New York

The Air-Cooled, Multi-Purpose
"New-Way"
5 Engines in 1

Digitized by Google

(Continued from page 74)

would see himself and his work in relation to both his immediate contacts, and their broader aspects and applications. He should develop, if not a big, at least a better detail and a better general point of view. A combination as rare as it is valuable.

After all, it is simply imagination that is to be developed. The little fellows can be taught to work with fictitious figures and people and conditions. They can be made to imagine situations and difficulties that might, but do not necessarily exist, to the end that when they have their real concrete problems, they can have this mental reservoir upon which to draw. They can acquire the power to visualize, to see non-existent things as clearly as if they did exist—clearly enough to follow their workings in detail through the maze of resulting changes and effects its application would have, and to be able to come close to the final answer without having to actually try out the scheme. Though this is real imagination of the simplest sort, it is not easy of accomplishment for unaccustomed minds. But no one gets anywhere above the execution of the detailed instructions of others without its use. No new trails are blazed, nothing of either abstract or material worth is ever accomplished without something considerably more than its casual cultivation and employment.

Men like to express themselves whether they know what they are talking about or not. Our job is to get them to know some things well; to be awake to what is going on around them, to get them to express what they see in their work, as well as what should be there that is not there, and then to do their work *some* percentage better. But it is always up to the employer to keep them awake. For men not only need a stimulus, they react powerfully to incentive. If they are to produce more, they must be given more. This, as a fundamental, is the rock upon which many attempts at getting better coöperation and a better degree of endeavor fail. It is too often made a one-sided proposition of give all for the benefit of the company, with no additional benefit to the givers. Within the limits of the individual, it is almost an axiom that the more he is given, the more-more-more he will produce. Which does not by any means mean just paying more in dollars and cents, but as much in giving stimulation, larger responsibility, inspiration, and the *opportunity of qualifying* for a greater monetary return.

If we can accomplish this idea of getting each employee at least once a year to tell us what he is thinking, we will get his viewpoint from the angle which most appeals to him. The expression of his ideas will show the line along which he is most interested, and hence most qualified to work, providing for a better fitting of the man to the job, with resulting increased efficiency. In the administrative departments, exactly square pegs do not long remain in exactly round holes. The obviousness of the mistake in such extreme cases soon shows up the error. The true misfit is when a very nearly round peg is jammed

Leading Firms Have Endorsed

MEECO

ICE-COOLED DRINKING FOUNTAINS

The Carnegie Steel Co. have 85 MEECO Ice-cooled Fountains, Cheney Bros. have 165 Dodge Bros. have 100, Fore River Shipbuilding Co. have 70, The National Tube Co. have 60, Pratt & Whitney Co. have over 50, Remington Arms Co., 120, U. S. Government departments have over 500, and the U. S. Steel Corp. 200. Many other concerns have from 25 to 50. There must be reasons. And there are. MEECO Fountains fulfill every requirement of modern usage. They are absolutely sanitary. They will stand up under the hardest kind of wear and tear. They are practical, efficient and fool-proof. Moreover they take up but little floor space, are easily installed and are pleasing in appearance. Their first-cost and up-keep is extremely low.



Fig. 627

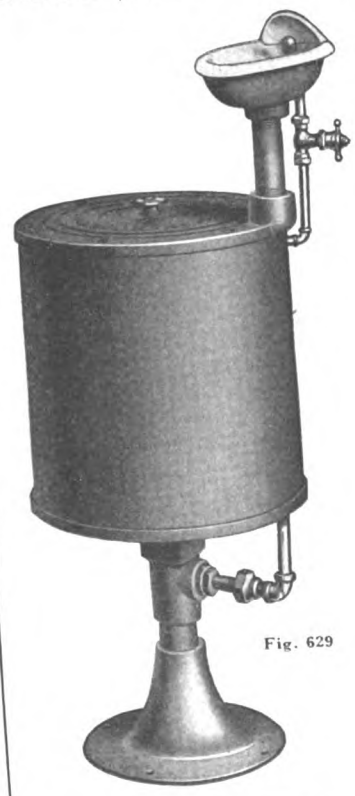


Fig. 629

On this page are shown but 3 of the 14 types of MEECO Drinking Fountains which have been designed to meet every possible requirement. MEECO Fountains are engineered, not merely manufactured. Catalogue, diagrams and price list will be gladly sent on request. Just address, DRINKING FOUNTAIN HEADQUARTERS, Framingham, Mass.

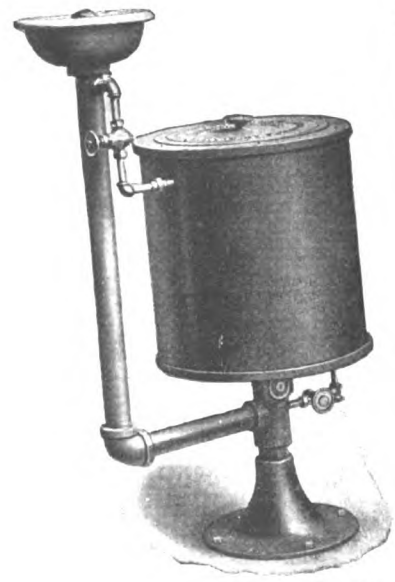


Fig. 604

A Few Representative Companies Who Are Using MEECO Drinking Fountains:

American Sheet & Tin Plate Co.
American Steel & Wire Co.
American Sugar Refinery
Baldwin Locomotive Works
Barber Asphalt Paving Co.
Bethlehem Steel Co.
Billings & Spencer
Boston Elevated R. R. Co.
Buick Motor Car Co.
Calumet & Hecla Mining Co.
Carr Fastener Co.
Celluloid Company
Champion Ignition Co.
Colgate Co.
Duluth & Iron Range R. R. Co.
E. & T. Fairbanks Co.
Fellows Gear Shaper Co.
Fisk Rubber Co.
Robert Gair Co.
General Electric Co.
Gilbert & Barker Mfg. Co.
Gillette Safety Razor Co.
Godell Tool Co.
Gray & Davis
Greenfield Tap & Die Corp.
R. Hoe & Co.
Hyatt Roller Bearing Co.
Ingersoll-Rand Co.
International Harvester Co.
Jones & Laughlin Steel Co.
Kellogg Toasted Corn Flake Co.
R. K. LeBlond Mach. Tool Co.
Lever Bros.
Link Belt Co.
Lodge & Shipley Mach. Tool Co.
Lowell Bleachery
Ludlow Mfg. Associates
Marvel Carburetor Co.
W. H. McElwain Co.
Mergenthaler Linotype Co.
Miller Lock Co.
Geo. H. Morrill Co.
National Shawmut Bank
National Zinc Co.
N. E. Confectionery Co.
New London Ship & Engine Co.
Nordyke & Marmon Co.
Oneida Community
Packard Motor Car Co.
Panama Canal, Purchasing Dept.
Plymouth Cordage Co.
Pneumatic Scale Corp.
Proctor & Gambell Co.
Quaker Oats Co.
Robbins & Myers Co.
Saco-Lowell Shops
Savage Arms Co.
W. F. Schrafft's Sons
Sears-Roebuck Co.
Wm. Skinner & Sons
Standard Oil Co.
Stewart-Warner Speedometer Corp.
Stone & Webster Co.
Strathmore Paper Co.
Taft-Pierce Mfg. Co.
Texas Co.
Tide Water Oil Co.
United Shoe Machinery Co.
U. S. Envelope Co.
Waitt & Bond
Waltham Watch Co.
Western Electric Co.
Etc., Etc.

Send for complete list of users.

Sanitary Washbowls, Steel Enclosures, Metal Cabinets

METAL MEECO PRODUCTS

Steel Lockers, Chairs and Stools, Shelving and Boxes

Manufacturing Equipment & Engineering Co.

Originators and World's Largest Makers of Ice-Cooled Drinking Fountains

FACTORY AND GENERAL OFFICES

FRAMINGHAM, MASS.

Branches, Agents or Dealers in all principal cities

Digitized by Google

into an oval hole, or a small square one into a triangular-hole—when a man fits in some of the essentials, but lacks in the less obvious, but frequently important ones. For it is a demonstrable fact that men of average or higher ability can do many things well, and a good many things exceptionally well, without over hitting that one thing they can do so much better than they can do all the others, and in which they would be the most interested and do the best work. Hence the value of anything that will really indicate their natural bent.

Not counting one's harmless and diverting hobbies, there is little excuse for a man's having a vocation *and* an avocation—one kind of endeavor for his living and work, and another for his pleasure. The latter field is the one in which his greatest success would lie had he developed himself to do well the thing he most enjoyed doing. I say there is little excuse. There is under present conditions much excuse. But there is little reason or justification for the extent to which the present manner of the administration of business permits the undevelopment of the talents which lie dormant in so many of those who are just helpers in the administration of business.

For further aid, in order that the achievements, labor saving methods, and discoveries of others may be used to the best possible advantage, a history and library of one's own and associated industries, past and contemporaneous—books, and especially current magazine articles—should be available. They should be used by all executives, and those in a position to become even minor executives. House organs, in large organizations, are a great opportunity and factor in this development. Besides being a medium whereby the management can get to the individual, they provide a path whereby the individual can get to the management, affording those who contribute to it a chance to show themselves apart from their specific jobs. Where they are possible, I do not believe it to be too much of a requirement to insist upon a contribution at least once a year by every man above specified grades in the organization, and these contributions scheduled, willy-nilly, and printed. The poor ones will not be as good as the good ones, but they will all improve, with corresponding improvement in the writers and their work.

One other important thing in this developing process. Do not delegate detail; delegate results. Give the man a chance to think. Make it necessary for him to think if he would hold his job. Be tolerant at first, naturally, and help him if necessary in finding out how to think, where to get his ideas, and how to get results from them. If time does not bring results—he is in the wrong place. But be sure his failure be not as much your fault as it is his own!

It may be said, of course, that it is all right to talk about these things that are so largely a matter of education, but that they should start in the primary schools. That it will take a generation to get results; and that we are interested in today's work, and today's results. Well, we can't begin

MISSISSIPPI

A Pattern for Every Use

MOST practical and efficient form of window protection against fire and breakage. Reduces insurance and cuts cost of maintenance to a minimum. Compare *Mississippi Wire Glass* with any other manufacturer's product and be convinced of the importance of Specifying outright—

MISSISSIPPI

The Pioneer Product



This Coupon Brings a Sample of FACTROLITE and Full Data

Mississippi Wire Glass Co., 219 Fifth Ave., New York
Gentlemen: Send me a Catalog and Factrolite Paper Weight as advertised in Industrial Illustrated. It is understood this does not obligate me in any way.

Name .....

Address .....

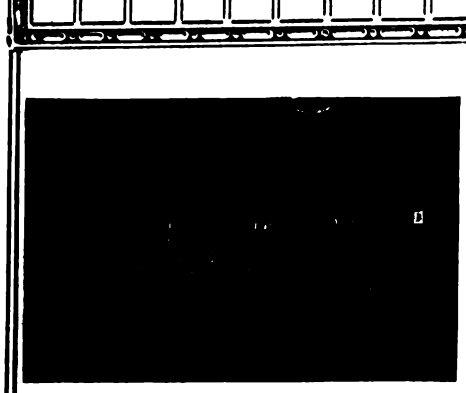
Mississippi Wire Glass Company

219 Fifth Avenue, New York

Chicago, Ill. St. Louis, Mo.

Digitized by Google

MATERIAL



ELECTRIC TRACTORS

Transport Tons

where hand trucks move pounds. They reduce expense in all your departments.

Request Catalog 1208.

The Elwell-Parker Electric Company

Cleveland, Ohio



MOTORBLOC

The Motor Driven Chain Hoist

The MOTORBLOC is hung up like any chain hoist.

He is pulling 1 Pound to Lift 2200 Pounds.

Light—Portable—Steel-Strong

"Hook Up, Plug In, Let's Go."
Write for full details



MOTORBLOC CORPORATION

Summerdale PHILADELPHIA

You Need This Book on Auburn Ball Bearings



"Ball Bearing Engineering" contains much useful information not only to Mechanical Engineers, Machine Designers and Draftsmen, but to all engaged in the manufacture or upkeep of machinery.

It contains examples of many special problems that have been answered and gives suggestions on bearing installations with lists of bearing styles and sizes.

Get a copy of this book for your reference files. Write today.

Steel, Brass and Bronze Balls

Auburn Ball Bearing Co.

20 Industrial St. Rochester N.Y.

Unrivalled Utility a Result of Unmatched Mobility—

You may buy the Northwest with the idea of using it for routine handling work—but you'll be surprised at the number of odd jobs it will do in spare time. Handles coal, ash, stone, sand, gravel with 1 yd. clamshell bucket on 40 foot boom; timbers, logs, stone slabs, pipe, building forms with grappling hooks; steel and iron scrap with powerful electric magnet; acts as dragline or as pile driver.

Northwest crawler base with truck-like steering device is controlled by one man; unequalled mobility; will mount pile and double-deck. Ask for specifications.

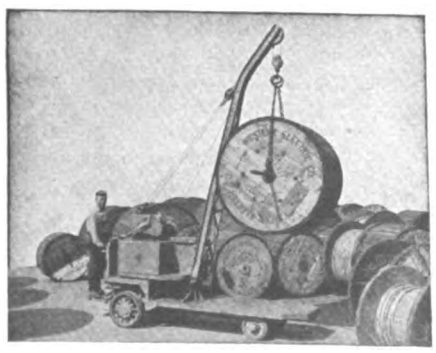
1231 Steger Bldg.

Northwest Engineering Co., Chicago, Ill.



Ask about the Northwest Gas or Electric Shovel—the shovel with only one motor.

NORTHWEST CRAWLER CRANE



Easiest Way to Handle 3,000 Pound Pieces

is on Electric Industrial Trucks equipped with **REVOLVING CRANES.**

Bulletin 51 tells how.

The Elwell-Parker Electric Company

Cleveland Ohio

HANDLING

yesterday, that's certain. And it can't be done overnight. It is the long time game that wins and pays when it is well and intelligently played. If we are willing to play it that way, results can be had—if we start with ourselves and the man next to us, and see that he does likewise.

As for the matter of education—there is much in that. The schools and colleges of our time can be said to make a fair attempt to scratch into the vast mental resources of the world; to make a real effort to awaken it. But the great indictment of our institutions of learning, or what more aptly should be applied to the attitude of our times, is that there is a well defined conception that the mental work of the student can end with his schooling, and particularly with his college work.

There is a great but seemingly most unrecognized need, for teachers of the fact that all life is a course of study. That particularly the field of human endeavor needs its participants to ever and constantly be studying and searching today, to meet the needs and problems of tomorrow. That the text book of school and college but gives way to the technical, business, biographical, historical, and inspirational publications of the doings and thoughts of the leaders of yesterday and today. It must be emphasized that study never means the mere committing to memory of so many pages of an assignment. It is the search for information along a given line, the application of that information to the problem or aim in hand, with the resulting intelligent solution, or a new light upon a given phase of endeavor.

Education is literally but a leading forth of hidden talents. The student does himself and society an injustice when he seems to concede that with the obtaining of his degree, there is nothing more to be led forth—that his mind will go on growing, or be prepared to meet the demands of tomorrow by what he learned, with the comparatively little training he had, in the schools of yesterday. The graduate should be made to realize that his rise above the average of the world, depends, in addition to the use of the natural qualities that go

to make up character, ... largely upon the degree ... which he bolsters up his ... limited experience and kn... edge by the already tried ... and proved experience of th... who have previously trod ... almost identical paths be... him.

This is not to imply ... these things are not done ... day. There are those of in... tive and ability and the fa... for hard and continued ... who already use these aids ... progress. One gratifying ... tration is the current tend... to establish schools for ... training of foremen in ... bers of our manufactu... plants. But even they ar... too few, and reach only a ... tion of the possible field.

Also, the number, qua... and worth of the corres... ence schools, university ex... sion courses, and the wealth ... trade and technical journ... which seem to find such ... ready distribution, argue ... there is not only an accep... need for these continued ty... of help in the world, but a ... use of them. But these effo... at group and self help are ... too limited. Too few real ... that aid in the solution of ... most any problem can be fo... in print, and that one of ... first things to be done ... facing the necessity of doi... anything upon which the de... nent hath insufficient know... edge, is to dig up what pu... lished information there ... available. Books and ma... zines, government reports a... statistics, the memoranda a... proceedings of technical s... eties and trade associations—even the usual wild prospectuses of those eager enthusiasts, the local Chamber of Commerce, or Boards of Trade—all have value as a source of special information and help.

The general acceptance ... these most vital principles ... not endanger those who ... ready use them, and aspire ... the planes their use will bring. It will but raise the general standard of human activity—bring that sixty-five per cent up to seventy-five per cent, maybe eighty-five per cent, possibly make that the average of human endeavor. There who are harder workers, ... more than the average in ... ative and ability, will still ... wide fields in which to work. They will find also that the ...

Digitized by Google

n tools with which the lead- and executives of the world 'e to work are sharper, der, and more powerful; l that they will have quicker l better aid in carrying out ir plans and ideas. The ef- ency of the individual in in- try will be raised by some preciable percentage—and preventable wastes lessen- by just that amount.

Additionally, we will be do- our part to offset the me- nicalizing tendency of the es by teaching the art of ation, and by furnishing a productive use for some of the spare time that modern efficiency makes so prevalent—time that often hangs heavily on the hands of those who have neither been trained, nor ever suspect that there is a pleasant, even a profitable use for it. Finally, we manufacture not only our mechanical product——*we become builders of men*, either of ourselves, or of others.

We are richer—have mined our wealth from within ourselves, and can never be so poor again!

Pitfalls of Employment Contracts

BY LESLIE CHILDS

T goes without saying, that the factory executive, charged with the responsi- ity of entering into con- acts of employment with lled or professional em- oyees, should exercise care drawing the terms of such reements. This is true be- use, contracts of this kind ay involve the payment of a rge sum of money in the urse of their operation, and so loosely drawn or ambigu- s in their terms as to lead to ter dispute and litigation, ay result in a material loss one or both of the parties ereto.

Contracts of this kind may formal, which is perhaps e safest method to follow as ey are more apt to express early the intentions of the rties, or they may be created an exchange of letters, or en orally. However, in any ent, there are certain points at should be clearly under- ood, such as the salary, the rm of the contract, and the ethod by which it may be terminated, if possibility of after dispute is to be reasonably avoided.

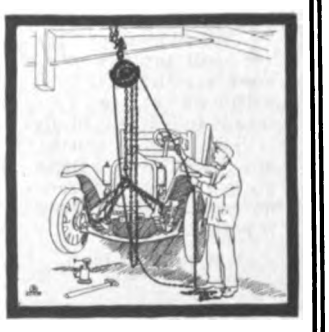
Of these points perhaps the one most frequently overlooked has to do with a clear statement of the time such a contract has to run. Not infrequently this point is left hazy, perhaps dependent upon the statement of the salary or other stipulations, and, unless the contract is terminated to the satisfaction of both parties, may form the basis of after dispute and perhaps costly litigation, that might have been avoided by the exercise of care in the beginning.

An excellent illustration of this danger point to the factory executive, when entering into contracts of employment, appears in the recent Michigan case of Loew *vs.* Hayes Mfg. Co., 188 N. W., 360. The case turned upon the construction of the salary clause in the contract, relative to its inference as to the time the contract had to run, and the outcome is very convincing of the importance

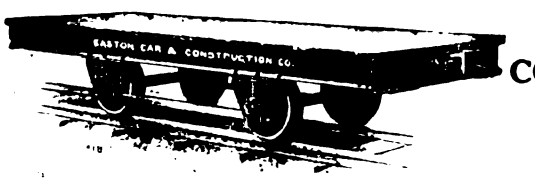
MATERIAL



Chain Hoists
FOR
All Purposes
¼ to 30 Tons Capacity
Safe Dependable Economical
Our catalog will interest you
WRIGHT
Lisbon, Ohio



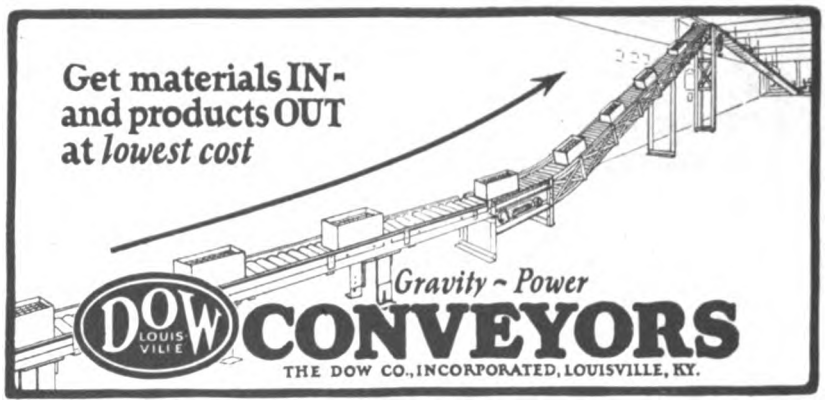
EASTON CARS



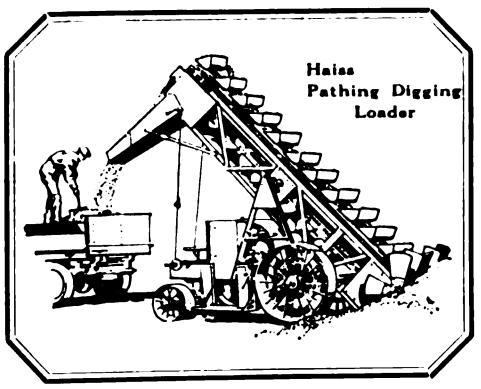
COMPLETE INDUSTRIAL RAILWAY EQUIPMENT

178-E
EASTON CAR AND CONSTRUCTION CO.
Main Office & Works: 45 Holley St., Easton, Pa.

Get materials IN- and products OUT at *lowest cost*



Gravity ~ Power
DOW LOUISVILLE CONVEYORS
THE DOW CO., INCORPORATED, LOUISVILLE, KY.



Stop Shoveling!
HAISS
Truck Loaders
do the same work—dig as well as load—ten times as fast at fractional cost.
See data in Bulletin 621
The Geo. Haiss Manufacturing Co., Inc.
146th St. & Canal Place, New York
Established 1892
Representatives throughout the world

YOUR ADVERTISEMENT
for the next issue of INDUSTRY ILLUSTRATED is now due.
The first closing date is the 10th of the month preceding the issue.
In order to get good service cuts and copy should be in as soon after the 1st of the month as possible. Send all advertisements to
Advertising Department
120 West 32nd St. New York

HANDLING

Digitized by Google

POWER

THESE motors will provide your machines with operating speeds to suit all kinds of jobs. They run at any speed over ranges up to 1 to 10. There is no power lost as speed is varied.

Get bulletin 1014 for details

Type A.S. Adjustable Speed RELIANCE MOTORS



Reliance Electric & Engineering Co.
1045 Ivanhoe Road Cleveland, O.
Branches: Boston, New York, Philadelphia Pittsburgh, Cincinnati Detroit, Chicago



Hays Improved Gas Analyzer. Note absence of pinch clamps, rubber connections and glass cocks.

TWO INSTRUMENTS WITHOUT EQUAL as aids in cutting fuel costs are pictured here. Each is the very best of its kind on the market.

We have for free distribution to power plant men some intensely interesting and instructive pamphlets about flue gas analysis and draft regulation. It will pay you to write for them.



Hays Differential Draft Gage. Baked black enamel finish, steel case Rugged, accurate.

The Jos. W. Hays Corporation
Combustion Efficiency Appliances
Michigan City, Indiana



"CALOREX" Burners
Using STEAM or AIR for Atomizing
MOUNTED FOR BOILER

33 years experience manufacturing liquid fuel equipment. Cheapest to operate—Simple in construction. *No parts to wear out*—Will last a life time. Burns FUEL OIL, CRUDE OIL or TAR. Write for catalog

W. N. BEST FURNACE & BURNER COMPANY
11 Broadway ENGINEERS IN CALORIC NEW YORK



Increase furnace life with—

PLIBRICO JOINTLESS FURNACE LINING

Plibrico is a plastic furnace lining in unbaked form. It can be applied by anyone who can pound it into place with a mallet and trowel it smooth. When baked, it forms a one-piece, jointless furnace lining that withstands temperatures to 3100 degrees F. There are no bricks to loosen and fall out—no joints to crack. Consequently, Plibrico lasts two to four times as long as ordinary furnace linings.

Put an end to furnace troubles—do it the modern way—the economical way. Next time, reline with Plibrico—or old, broken fire brick linings, when patched with Plibrico, often give months more service.

Plibrico is sold only in steel containers of distinctive appearance as shown opposite.

Write for new fifty-page booklet, just off the press— "Modern Furnace Building."

Jointless Fire Brick Company
1154 Clay St. Chicago

CLOSING DATES FOR ADVERTISEMENTS

Cover and Special Positions, 5th of month preceding issue.
R. O. P. Ads to be set . 10th " " " "
R. O. P. Ads Plated . . 15th " " " "
It is to your advantage to send copy and cuts as soon as possible.

Advertising Department
INDUSTRY ILLUSTRATED
120 W. 32nd St., New York

EQUIPMENT

of a positive statement in such contracts in respect to their duration. The material facts, as taken from the report, were as follows:

The plaintiff had, it appears, been negotiating with the defendant relative to his employment. Thereafter the defendant wrote him a letter which, among other things, contained the following offer of employment:

"As per our conversation yesterday we will agree to employ you at the rate of six thousand dollars ($6,000.00) the first year, sixty-six hundred dollars ($6,600.00) the second year, and seventy-two hundred dollars ($7,200.00) the third year—same payable monthly in case you decide to come with us.

"Your work will consist generally of tool designing, special machinery, engineering and other things pertaining to your line of work, and no doubt can be of great assistance to us in our sales department in obtaining new business.

"In other words, I feel that you should be a 'free lance' to be at the service of the writer, and it might be necessary to occasionally visit the Hayes Ionia factories at Grand Rapids and Ionia, Michigan, on some consultation work, etc.

"I trust you will be in a position to accept our offer, and, awaiting your reply, remain

"Yours very truly, Hayes Manufacturing Company, (Signed) H. J. Hayes, Ass't to President."

The plaintiff accepted the above offer of employment in writing and entered upon the duties of the position January 3, 1918. He continued in the employment until June 13, 1918, when he was discharged. Thereafter he brought the instant action for damages, on the theory, it seems, that he had been employed for a period of three years, and that his discharge had been wrongful.

At this point it is worthy of note that the letter of the Hayes Manufacturing Company, quoted from above, offering the plaintiff employment, contained the whole contract of employment. This letter, it will be noted, did not specifically state the period of employment, but it did state

that the plaintiff would paid "at the rate of" so m for the first, second and t year. Upon the discharge the plaintiff then, about months after he had entered upon his duties, this phase the contract became the ba for a serious dispute:

Contentions of the par stated.

The plaintiff, as has b noted, contended that his ployment was for a period three years, and that he h been wrongfully discharge The defendant, Hayes M ufacturing Company, took position that the employme was for an indefinite period time, and that the stipulat as to the rate did not contemplate a definite employme for three years, but w merely a statement of the s ary the plaintiff was to rece providing he remained w the company three years, a that it had the right to d charge the plaintiff at a time.

Upon the trial of the case the lower court, the plaint recovered a judgment again the Hayes Manufactur Company for $8,200. An a peal to the Supreme Cour Michigan was taken and b the defendant, Hayes Man facturing Company, in stati its contention as to the co struction to be placed upon contract as to time, amon other things, said:

"The contract states th the plaintiff is employed 'at rate' of compensation. It do not state that he is employ for one year or any other p riod. The company does n agree to pay him this compe sation for each of the th years mentioned, but at t rate of certain yearly amount for each of the three years case he is there. An increa scale is provided for in ca the plaintiff remains, in the d fendant's employ during t periods mentioned. It is contract fixing the rate of com pensation, but not fixing t term of employment."

In passing upon this ques tion the court reviewed seve decisions from other stat and noted that there wa some conflict in the authorities It however, declined to accept the construction offered by t Hayes Manufacturing Com pany, and in stating its con clusions, on the meaning of t

Digitized by Google

ns employed in the contract
d the following language:
ıtract held to be for three
rs.

We do not think the lan-
ge of the contract is am-
uous. * * * When it is
l, 'We will agree to pay
at the rate of six thousand
lars the first year, sixty-two
ıdred dollars the second
r, and seventy-two hundred
lars the third year,' it is
rly inferable that a hiring
three years is contem-
ted and offered, and, when
epted, that it is a hiring for
ee years, and we so construe
language used. * * *''

The court then, after noting
ıt the question of whether
not the Hayes Manufactur-
Company had been justi-
l in terminating the con-
ıct was one of fact and be-
decided in favor of the
ıintiff would not be dis-
bed, concluded by affirming
judgment rendered in the
ver court in favor of the
ıintiff.

As noted by the court in the
regoing opinion, the cases
volving a construction of
ntracts of this kind are not
ecisely in accord, which
ould seem all the more rea-
n for great care by the fac-
ry executive in entering into
ntracts of employment with
illed or professional em-
oyees. The foregoing deci-
on furnishes a striking and
luable illustration of how
ch a contract, unless clear
ıd explicit in its essential
rms, may lead to costly after
spute and possible litigation.
It follows then, that, in jus-
e both to the employee and
e employer, contracts of em-
oyment with skilled or pro-
ssional employees should be
ıtered into with prudence.
ertainly the essentials, such
the term of employment,
lary, and conditions upon
hich it may be terminated,
e so far reaching in their
ter effects that they should
stated with great clarity in
e formal contract or the let-
rs whereby the agreement is
nsummated. And if reason-
ble care is used in this respect
will, as a general rule, be
orth its weight in gold as in-
ırance against possible after
ıspute in respect to the mean-
ıg of the terms employed.

For photographs in this issue, not otherwise credited, we are indebted to the courtesy of the following:

A "NEW" SCIENCE, MORE THAN FIVE GENERATIONS OLD

Carey, Lee & Blanchard, publishers of Oliver Evans book, "The Young Miller's and Mill-Wrights Guide."
Chain Belt Company.
Jeffrey Manufacturing Company.
Standard Conveyor Company.
Geo. Haiss Mfg. Company.
Elwell-Parker Electric Company.
Cleveland Crane & Enginering Company.
Barber-Foster Engineering Company.
Pawling & Harnischfeger Company.
Industrial Works.
Niles-Bement-Pond Company.

FEED WATER TREATMENT

Graver Corporation.
H. S. B. S.-CochraneCorp.
Wm. B. Scaife & Sons Co.
Wayne Tank & Pump Co.
Power Plant Specialty Co.
American Water Softener Co.
Dodge Mfg. Corp.

THE FUTURE OF BELT CONVEYING

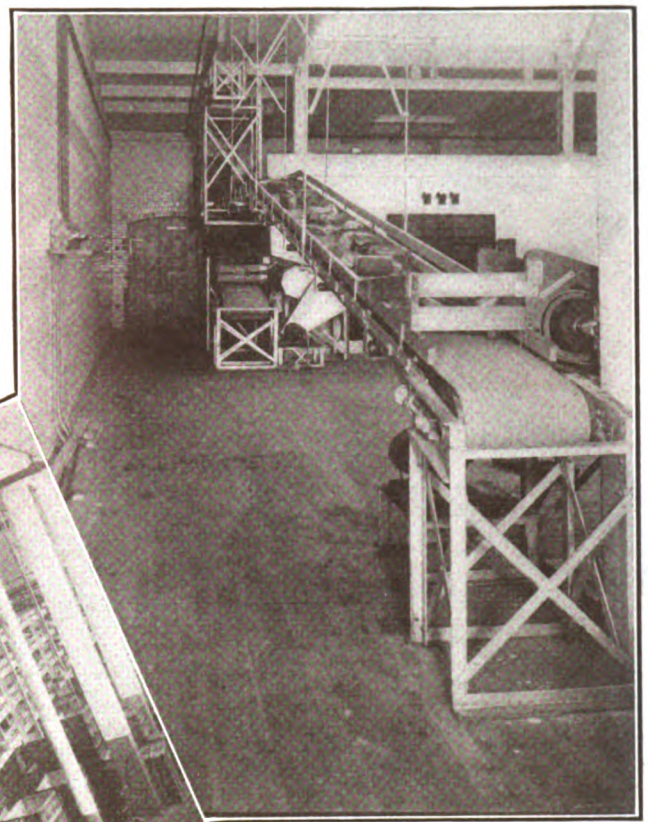
Goodyear Tire & Rubber Co.
Stephens-Adamson M. Co.
Main Belting Co.
Link-Belt Co.
Hyatt Roller Bearing Co.
Lamson Co.

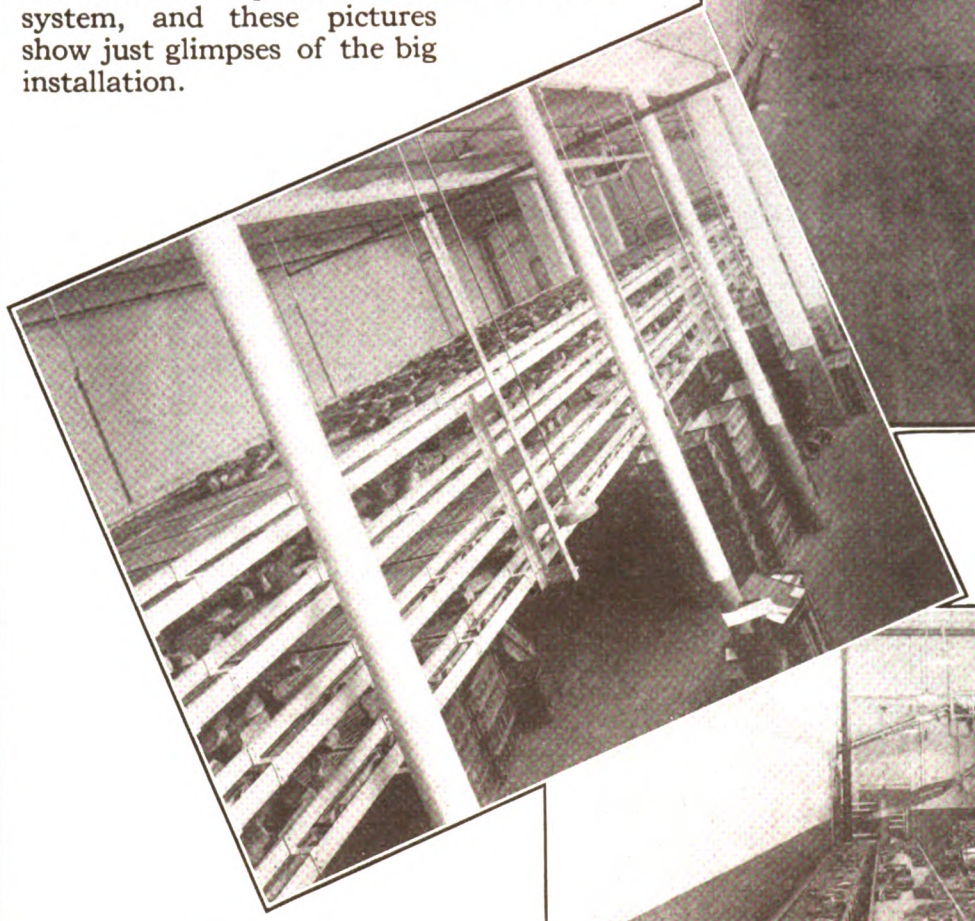
Speaking of Bread

affords an Opportunity to demonstrate the flexibility and versatility of

Mathews Gravity and Power Conveyers

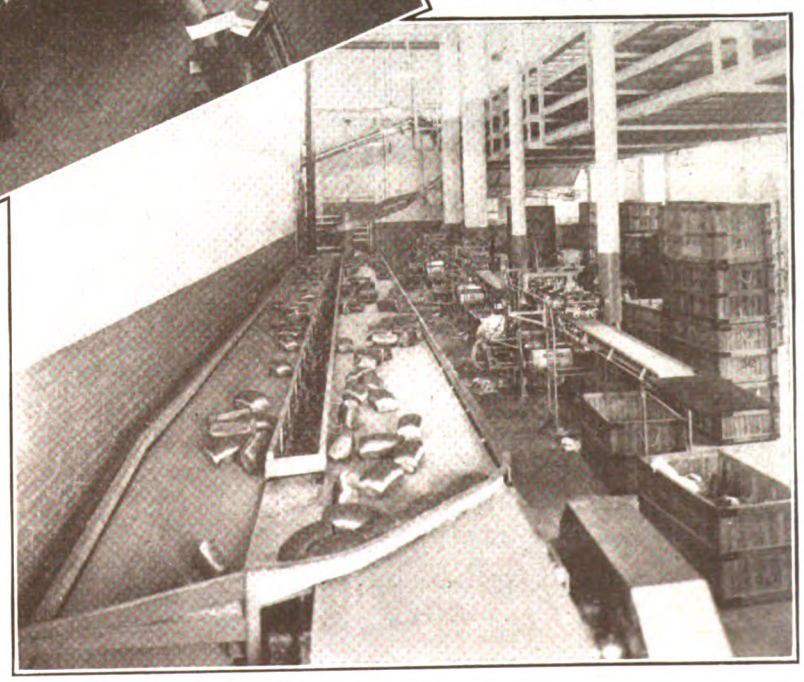
The General Baking Co. have connected up their various departments with a Mathews system, and these pictures show just glimpses of the big installation.





Every manufacturer has problems involving the routing of raw materials and finished products.

There is a Mathews engineer near you ready to start work on a general handling system for your plant.



Come to
Package Handling Headquarters

with your conveying troubles.

Our engineering survey costs nothing. If we cannot offer an acceptable solution of your conveying problems.

Send for General Catalog

Mathews Gravity Carrier Co.

Branch Factories:
Port Hope, Ont.
London, England

161 Tenth Street,
Ellwood City, Pa.

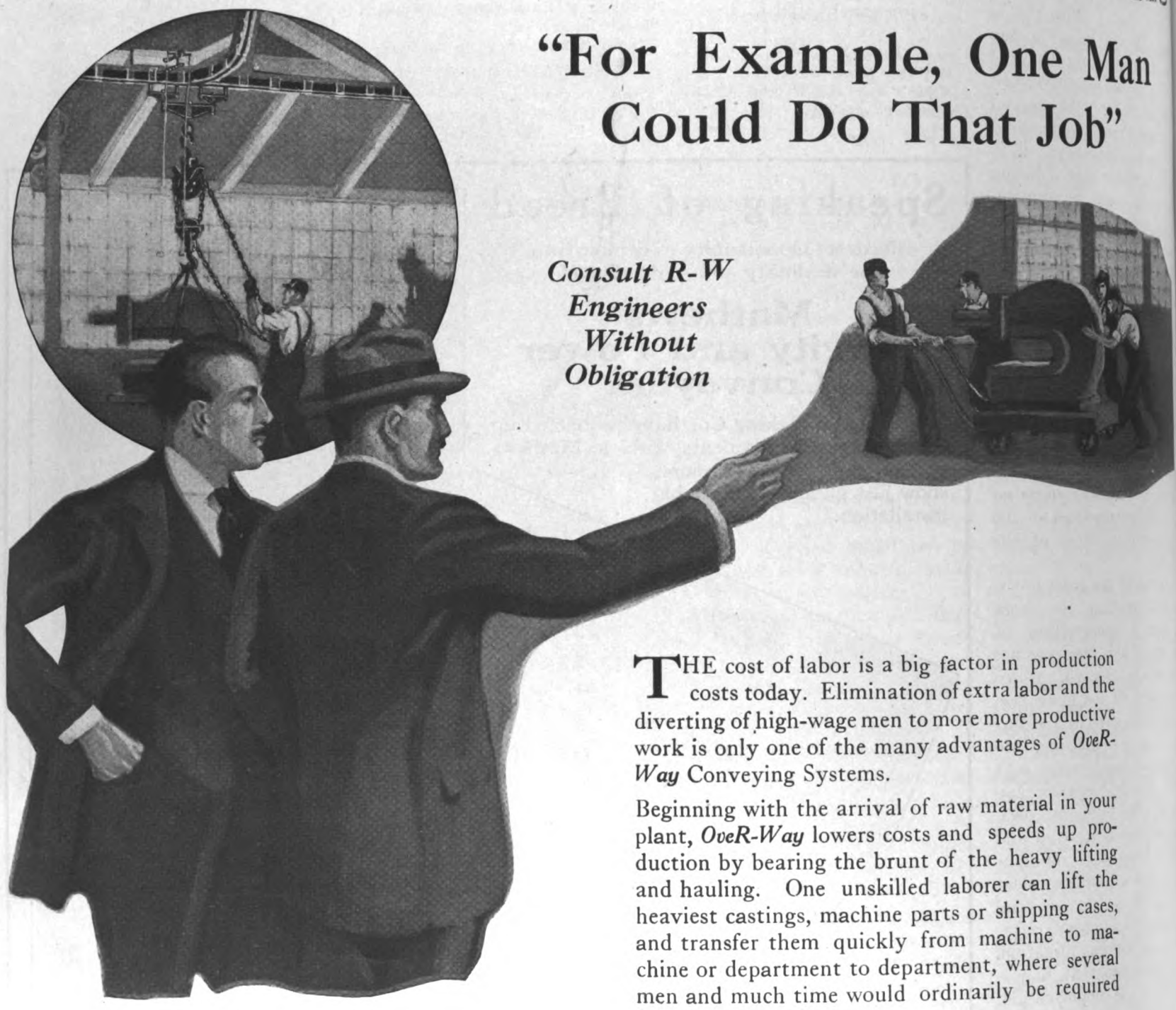
Digitized by Google

RICHARDS-WILCOX R-W AURORA TRADE MARK

Richards-Wilcox
Quality leaves its imprint

RICHARDS-WILCOX R-W AURORA TRADE MARK

"For Example, One Man Could Do That Job"



Consult R-W Engineers Without Obligation

THE cost of labor is a big factor in production costs today. Elimination of extra labor and the diverting of high-wage men to more more productive work is only one of the many advantages of *OveR-Way* Conveying Systems.

Beginning with the arrival of raw material in your plant, *OveR-Way* lowers costs and speeds up production by bearing the brunt of the heavy lifting and hauling. One unskilled laborer can lift the heaviest castings, machine parts or shipping cases, and transfer them quickly from machine to machine or department to department, where several men and much time would ordinarily be required by old-style methods.

Take Advantage of this Free Service

Our Engineering Department has solved conveying problems for practically every type of business. We can tell you in a short time how *OveR-Way* can be adapted to your peculiar requirements, and submit complete plans and specifications, including estimated savings. This service is given without cost or obligation to any manufacturer who earnestly desires to modernize his plant, increase speed and quantity of production, and lower his production costs.

OVER-WAY

Write today for Catalog **V-23**, illustrating and describing *OveR-Way*, and ask us for full particulars as to how our Engineers can solve your heavy handling problems.

New York
Boston
Philadelphia
Cleveland
Indianapolis
St. Louis

Richards-Wilcox Mfg. Co.
"A Hanger for any Door that Slides"
AURORA, ILLINOIS, U.S.A.
RICHARDS-WILCOX CANADIAN CO., Ltd.
Winnipeg LONDON, ONT. Montreal

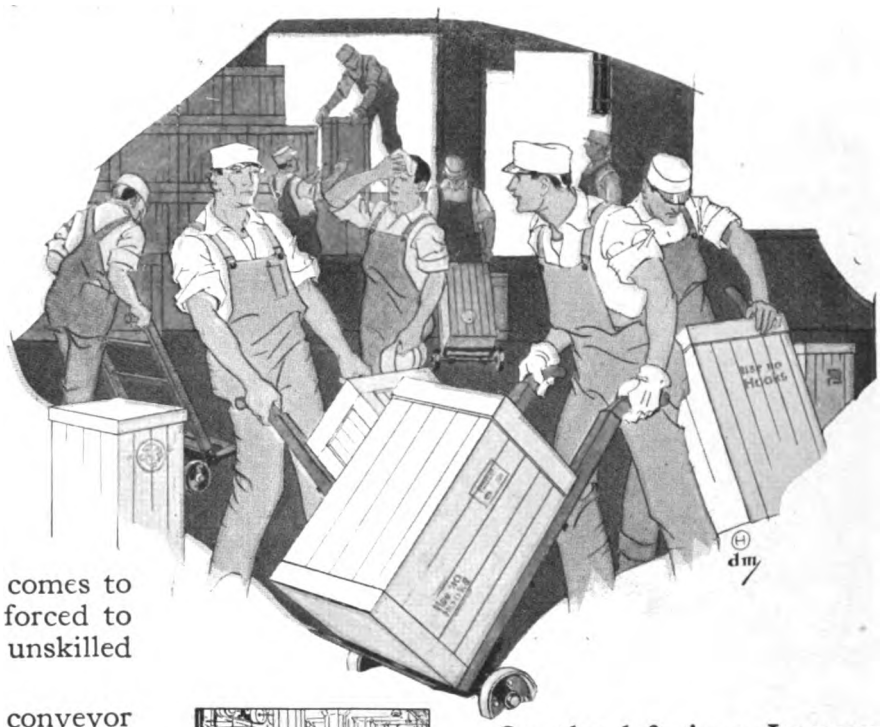
Chicago
Minneapolis
Omaha
Kansas City
Los Angeles
San Francisco

[903]

Digitized by Google

These men must be paid

IF your handling is done by human hands, it is time you began to look into mechanical conveying. For every unnecessary movement these men make is wasting their time and effort and costing you money.



If you are short of labor the conveyor comes to your rescue. Skilled workmen are not forced to handle materials formerly moved by unskilled labor.

If your factory is crowded, the proper conveyor will clear your aisles. It will keep packages and materials moving automatically in a steady flow from operation to operation.

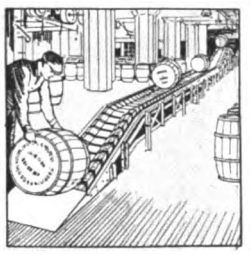
If the amount of partly finished work in the plant is too large, a conveying system enables you to reduce it below the danger point. Conveyors greatly shorten the time for turning raw materials into finished goods.

Mechanical conveying in some form is needed in practically every factory, warehouse or wholesale establishment. It sets the pace for assembling orders, for production in the shop, and keeps finished products moving regularly through the shipping-room. Wherever used it cuts rehandling costs and releases hand-labor for productive work.

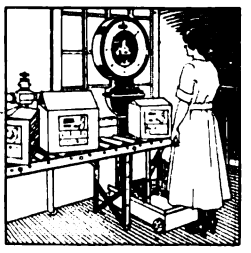
Which of these types of conveyors is needed in your factory?



This is the Lamson Belt Conveyor, the simplest type of power conveyor. It surmounts heavy grades, links buildings and departments floors apart, and different parts of a work-room.



On the left is a Lamson Heavy Duty Power Conveyor. It carries barrels, crates, sacks, and will bring whole trainloads of bulky, heavy products to their destination without waste of time or effort.



A Lamson Gravity Conveyor costs nothing to operate. When it is set at an inclination, packages placed upon the rollers move along by their own weight. The picture shows a product being weighed on a special scale section, as it passes along on a gravity conveyor.

Talk this over with a Lamson engineer

The work of the Lamson Company is to analyze handling problems, to know when conveyors are needed, and to keep them working properly after they are installed. Perhaps conveyors in *your* factory will reduce the number of men who must be paid, or enable them to work more efficiently.

It will cost you nothing to have a Lamson Engineer come from our nearest branch and study your handling problems. He can tell you whether conveyors are indicated in your plant.

THE LAMSON COMPANY
SYRACUSE, NEW YORK
Branches in Principal Cities

LAMSON SERVICE

Lamson Conveying Systems

Digitized by Google

a page from a story of remarkable economies

Low Cost Load Moving and Lifting

Relief for Labor Shortage in Powerful Little Electric Hoist

By A. LiftAbout

LABOR shortage to-day, and the earnest efforts, during the past few years, for rock bottom production costs, have lead to a close scrutiny of every operation of manufacturing and distribution, with the result that changes have been made necessary in the methods of moving and lifting loads. Available labor has been made adequate to the requirements; production costs have been lowered, because of greater speed and efficiency; briefly, low cost load moving and lifting now are enjoyed by thousands who have adopted a small powerful electric hoist—the *LiftAbout*.

Investigation has shown in many instances that methods of handling material which had been in practice for years and presumed to be economical, were very costly, slow, and inefficient when compared with the *LiftAbout* way.

This powerful little hoist is applied in practically every industry and business, and in each case a substantial saving is evident. Very often, it takes the place of a freight elevator, and for a very small investment adequate hoisting facilities between floors are provided, with the added feature of equipment that handles a load direct from truck, carrying it to points on a floor without change or rehandling. For 90 percent of the cost of an elevator, the Formica Insulation Co., Cincinnati, installed a *LiftAbout* which does all rehandling between the floors.

Some of the savings this hoist makes for others are:

For The Crex Patent Column Co., Chicago, hollow cylindrical steel columns filled with cement are loaded on trucks requiring but two men, whereas eight were needed previously. The saving in time and labor amounts to $6,000 yearly.

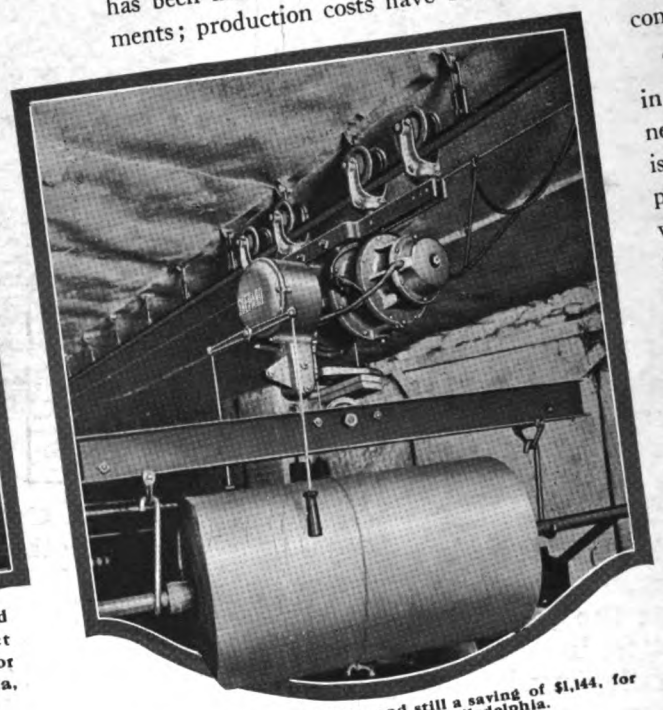
The Consolidated Ice Co., Philadelphia, secured a highly efficient and handling equipment for $300 instead of $1500, the cost of conveyor which a *LiftAbout* saved.

John Frost, dealer in hay, feed, and grain, at Watkins, N. Y., has been enabled to double storage capacity, release labor for other work, and increase business by prompt service to more customers.

Savings in time, labor, and money—very often unusual savings—can be brought to you through this low priced electric hoist. A step in the right direction, would be for you to fill in and return the coupon.



In place of an expensive freight elevator, and more "versatile," for load is not only lifted direct from truck, but is carried to points on second floor without rehandling. Sobar Co., Philadelphia, saved $2,200 on initial investment.



Production increased 80%, and still a saving of $1,144, for Paper Manufacturers Co., Philadelphia.

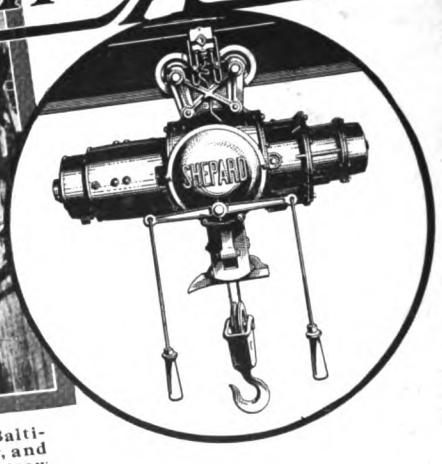


Edward Hines Lumber Co., Chicago, find a $4,400 saving in the *LiftAbout*. Three to eight men released on various timber rehandling jobs



C. H. Lears & Sons Co., Baltimore, installed a *LiftAbout*, and lift four or more bales of straw at a time, instead of one or two with block and tackle.

THE SHEPARD ELECTRIC LIFT ABOUT



SHEPARD ELECTRIC CRANE AND HOIST CO.
420 Schuyler Ave.,
Montour Falls, N.Y.

A Step in the right Direction

NAME _____

ADDRESS _____

CITY AND STATE _____

TELL US HOW YOUR LIFTABOUT WILL LIFT AND MOVE _____

Shepard Electric Crane & Hoist Co.
420 Schuyler Ave., — Montour Falls, N.Y.

SHEPARD
ELECTRIC CRANES & HOISTS

Digitized by Google

JUNE 1923

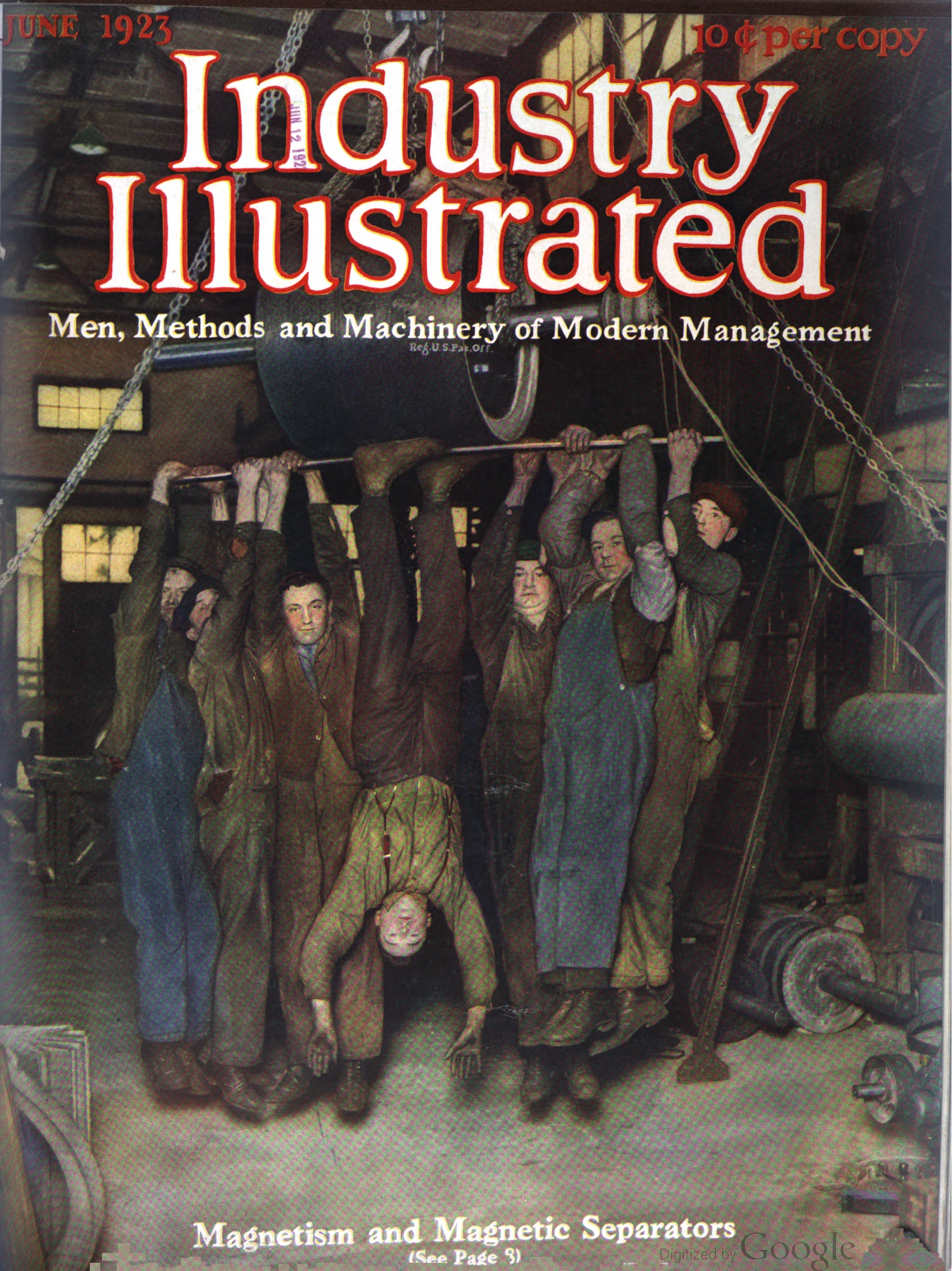
10¢ per copy

Industry Illustrated

JUN 12 1923

Men, Methods and Machinery of Modern Management

Reg. U.S. Pat. Off.



Magnetism and Magnetic Separators

(See Page 3)

Digitized by Google

Let The Cobwebs Form On Your Grease Gun!



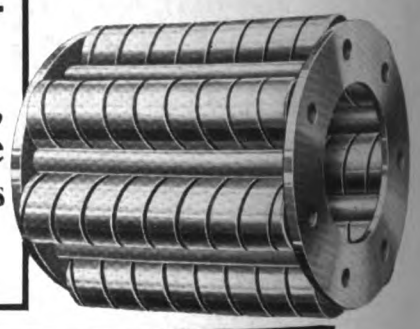
Hyatt equipped trailers and trucks only need to be greased three or four times a year!

This means a lubrication saving of at least 80%.

Get Hyatt bearing trailers and trucks and let the cobwebs form on your grease gun, an idle lubrication outfit will mean a great saving to you.

Three to four months is a long time for trailers and trucks to run without greasing but when Hyatt equipped they do it and give years of easy running, low maintenance service.

Practically all manufacturers of trailers, lift trucks and trucks of other types are prepared to furnish their standard designs Hyatt equipped.



HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago San Francisco
Worcester Milwaukee Huntington Minneapolis Philadelphia
Cleveland Pittsburgh Buffalo Indianapolis

Digitized by Google

INDUSTRY ILLUSTRATED

CONTENTS

June, 1923

Editorial—The Growth of an Idea Page 7

Magnetism and Magnetic Separators 8
By R. A. Manegold—Their Application and Use in Industrial Development

Keeping the Fire Demon Out of Your Coal Pile 10
By J. F. Springer

Do We Need More Foreign Labor? 13
Secretary of Labor James J. Davis, on Immigration

Painting the Factory 14
By Reginald Gordon—How and When to Paint It—and Why

Making Real Vacations Possible 17
By George W. Gray—Companies that Provide, Not Only the Time, But the Place

The Latest Answer to High Fuel Costs 18
By James T. Beard, 2nd—The Present Status, and Future Possibilities, of Pulverized Coal Burning

Shooting Big Game, Pictures, and Cement 21
By E. H. Rowe—Carl Ethan Akeley, Supergunman, Sculptor, Inventor

Moving Mountains Without the Shovel Gang 22
By Matthew W. Potts—Handling Bulk Materials at Half the Cost

New Use for the Bulletin Board 28
By George P. Hutchins—Establishing Human Contact With the Workers

Jack In Office 37
By P. B. McDonald

On page 36 will be found a list of those concerns to whose courtesy we are indebted for photographs in this issue not otherwise credited.

Published Monthly at Cooperstown, N. Y., by

THE ENGINEERING MAGAZINE CO.

Founded 1891 by
JOHN R. DUNLAP
Chairman of the Board

Editorial and Executive Offices 120 W. 32nd Street, New York, U. S. A.

JOHN H. VAN DEVENTER, *President* — HARVEY CONOVER, JR., *Vice President*
JOHN R. DUNLAP, JR., *Secretary*

Vol. 4, No. 6. Subscription price $1.00 per year; single copies 10 cents.

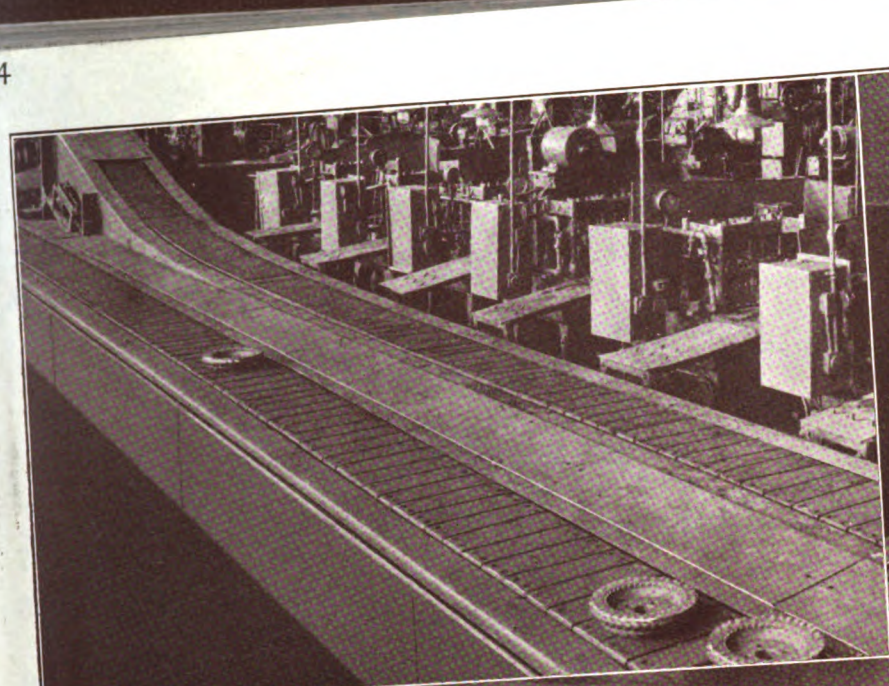
Copyright, 1923, by The Engineering Magazine Co., in both the United States and Great Britain.

Entered as mail matter of the second class at Post Office at Cooperstown, N. Y. Oct. 20, 1921, under the act of Mar. 3, 1879. Made in U. S. A.

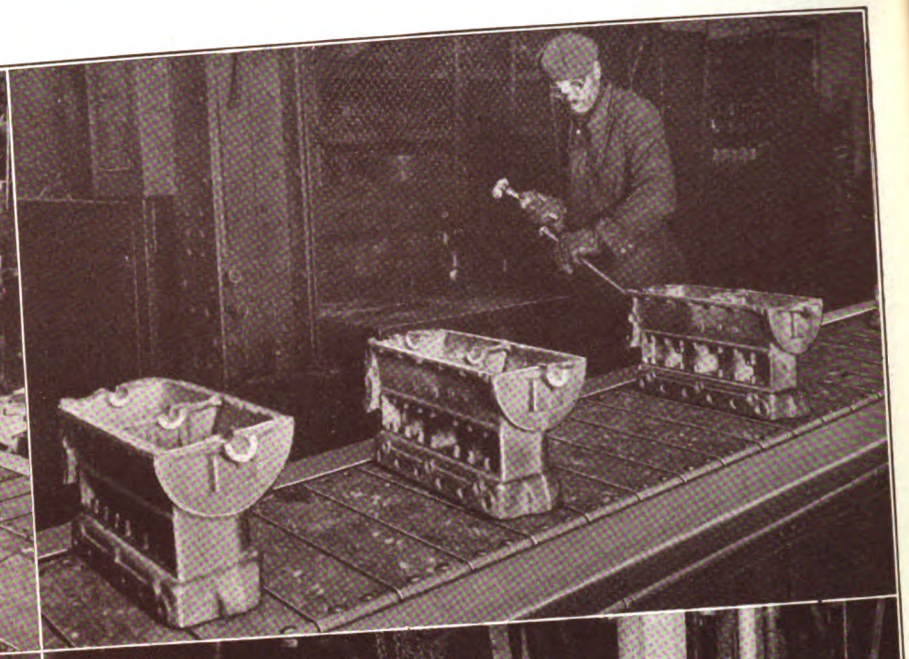
Conveyor System in the Modern Laundry.

We are always glad to supply, on request, information regarding any illustrations which appear in INDUSTRY ILLUSTRATED.

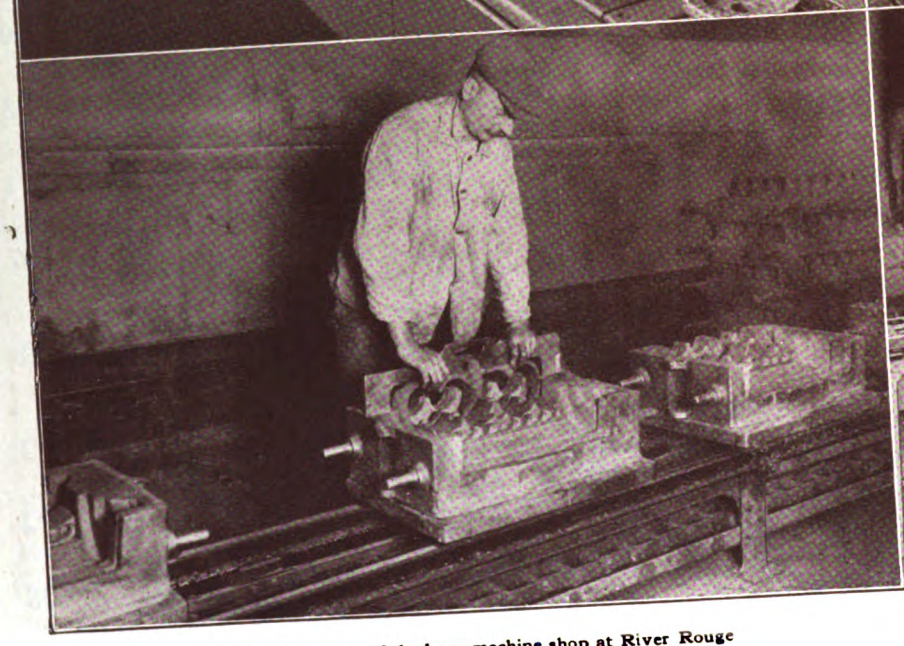
Digitized by Google



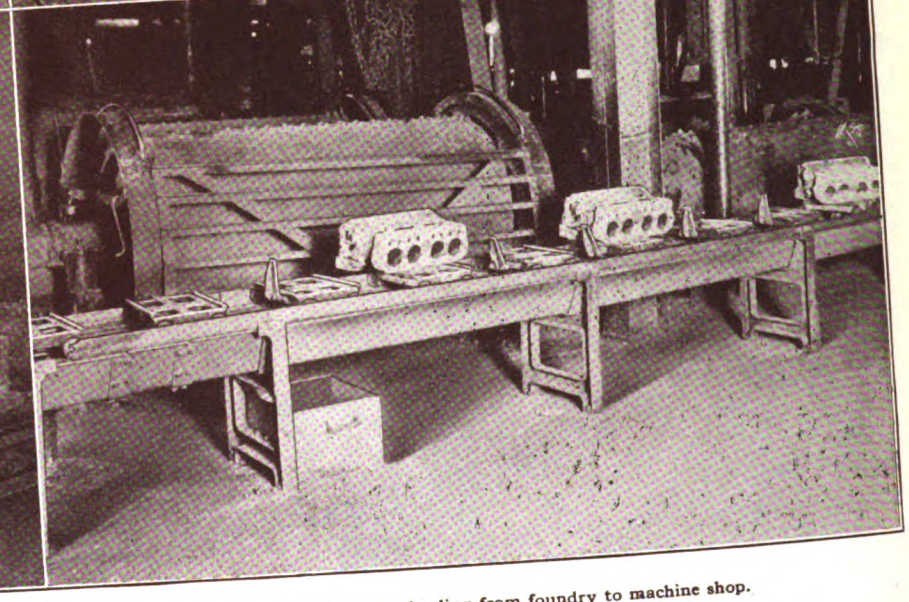
The entire output of the huge machine shop at River Rouge is transported on these two finished stock conveyors



Rough stock conveyor leading from foundry to machine shop. Chipping operations performed en route



Portion of one of the seven heavy "drag systems" on which Ford cylinder molds are constructed "on the move"



Especially designed Link-Belt cylinder conveyors lead to the heavy tumbling barrels and delivers tumbled castings to the rough stock conveyor

Link-Belt Conveyors at Ford Plant

Shop transportation has been brought to the highest degree of perfection and efficiency at the Ford Plant.

The cost of handling the rough and finished castings for 500 Fordson Tractors and 500 Ford Car Cylinder Blocks which are machined every 24 hours, has been cut to the minimum.

From the foundry on through the machine shop, to the shipping platforms, Link-Belt Conveyors handle this enormous production, resulting in the elimination of transient storage and trucking.

Thus the square-foot floor space over-head, and investment in stock-in-process, are both reduced to the absolute minimum.

The co-operation we were able to give the Ford Engineers in helping them towards efficient material handling and labor-aiding methods is available to every manufacturer desirous of cutting his overhead.

The Link-Belt line covers material handling equipment of all types, elevators and conveyors, locomotive cranes, crawler cranes, electric hoists, portable loaders, etc. Let our engineers show you how Link-Belt equipment can effect similar results for you. Send for catalogs.

LINK-BELT COMPANY
CHICAGO, 300 W. Pershing Road

PHILADELPHIA, 2045 Hunting Park Ave.

New York . . . Woolworth Bldg.
Boston 9 . . . . 49 Federal St.
Pittsburgh . . . 335 Fifth Ave.
St. Louis . . Central Nat'l Bank Bldg.
Buffalo . . . . 745 Ellicott Square
Wilkes-Barre . . 2d Nat'l Bank Bldg.
Huntington, W. Va. Robson-Prichard Bldg.
Cleveland . . . 429 Kirby Bldg.
Detroit . . . 4210 Woodward Ave.
Kansas City, Mo. . 306 Elmhurst Bldg.
Seattle . . . 820 First Ave., S.
Portland, Ore. . . . 101 First St.
San Francisco . . 168 Second St.
Los Angeles . . 163 No. Los Angeles St.
Denver, Lindrooth, Shubart & Co., Boston Bldg.
Atlanta, 610-611 Citizens and S'thrn. Bk. Bldg.

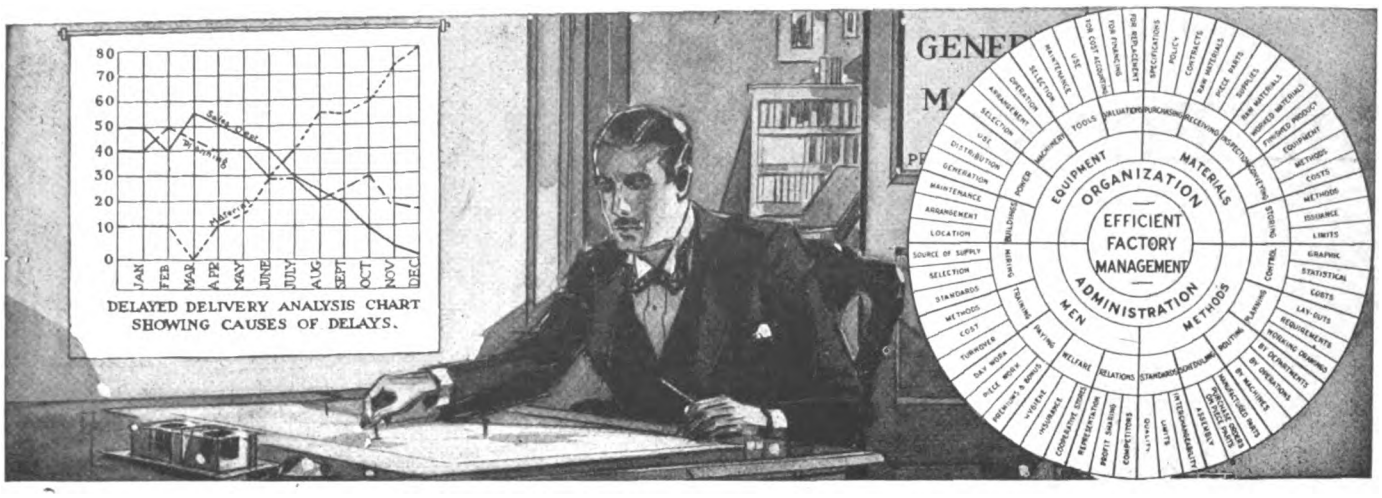
INDIANAPOLIS, Belmont Ave. at Big Four R. R.
Louisville, Ky., Frederick Wehle, Starks Bldg.
New Orleans, C. O. Hinz, 504 Carondelet Bldg.
Birmingham, Ala., S. L. Morrow, 720 Brown-Marx Bldg.

Canadian Link-Belt Co., Ltd., Toronto and Montreal

H. W. CALDWELL & SON CO., CHICAGO NEW YORK, Woolworth Bldg. DALLAS, TEXAS, 709 Main St.

LINK-BELT

Digitized by Google



300,000 Jobs Like This Are Waiting

You can have one if you have the ambition. If you are content to plug along on a moderate salary, doing routine work until you are fifty—don't read any further. This message is for real men. Live thinkers. Men who want to DO things—not to BE TOLD to do them.

Listen then, you men who do not want to stay in a rut. If you want to get up higher where the atmosphere is clearer—where you can use vision, where you can get some of the real joy of directing men—where you can command a salary which will give you these things which you envy the other fellow for now. Listen—for industry is calling you. Here is your big field—industrial engineering. It offers you the finest chance for quick and substantial reward, if you are willing to spend a little time and a little money on yourself.

Every manufacturing company in the country wants men who understand how to get economical production. The old wasteful methods must go. Men are wanted who know what to do—there is no place for guessers.

President Harding, Secy. Hoover, every engineer of prominence, every publication of importance—has stated the fact—

PRODUCTION MUST INCREASE, THE WASTE IN INDUSTRY MUST BE ELIMINATED, PRICES MUST COME DOWN.

It is not a call for machinery—not a call for material—but it is a call for trained men, for men who understand the control and operation of men—methods, material and equipment—who have the knowledge which enables them to direct a manufacturing organization toward sound and economical production.

This is your opportunity. Do you want it? Have you got the common sense—that's plain English—to train yourself for a big job like this? What does it mean to you? To your family? To your future?

THE ONLY COMPLETE COURSE IN INDUSTRIAL MANAGEMENT

The Industrial Extension Institute has been telling its message to men like you for years. The Institute knows that mere curiosity or indifferent interest are not worth the time and effort to stimulate. But if the opportunity to do bigger things—in a bigger way—means anything to you—if production work attracts you—then we invite you to fill the coupon below.

It will bring to you our booklet "Thinking Beyond Your Job," which tells you about the Factory Management Course and Service. This is a practical course of home study and reading, with practical field problems, prepared by sixty-three men who are recognized leaders in the industrial world. These men—Steinmetz—Knoeppel—Babson—Towne—Myers—Ficker—Gantt, etc., have put into the Course the essence of their many years of experience in the industrial field. Think what it means to you to get this training as *your starting point.*

SIGN THE COUPON. MAIL IT TODAY.

Industrial Extension Institute

11-17 East 45th St. **New York, N. Y.**

The only Complete Course in Industrial Management

Industrial Extension Institute
11-17 East 45th Street, N. Y. C.

Please send to me without obligation your free booklet "Thinking Beyond Your Job."

Name .....

Address .....

Present Work .....

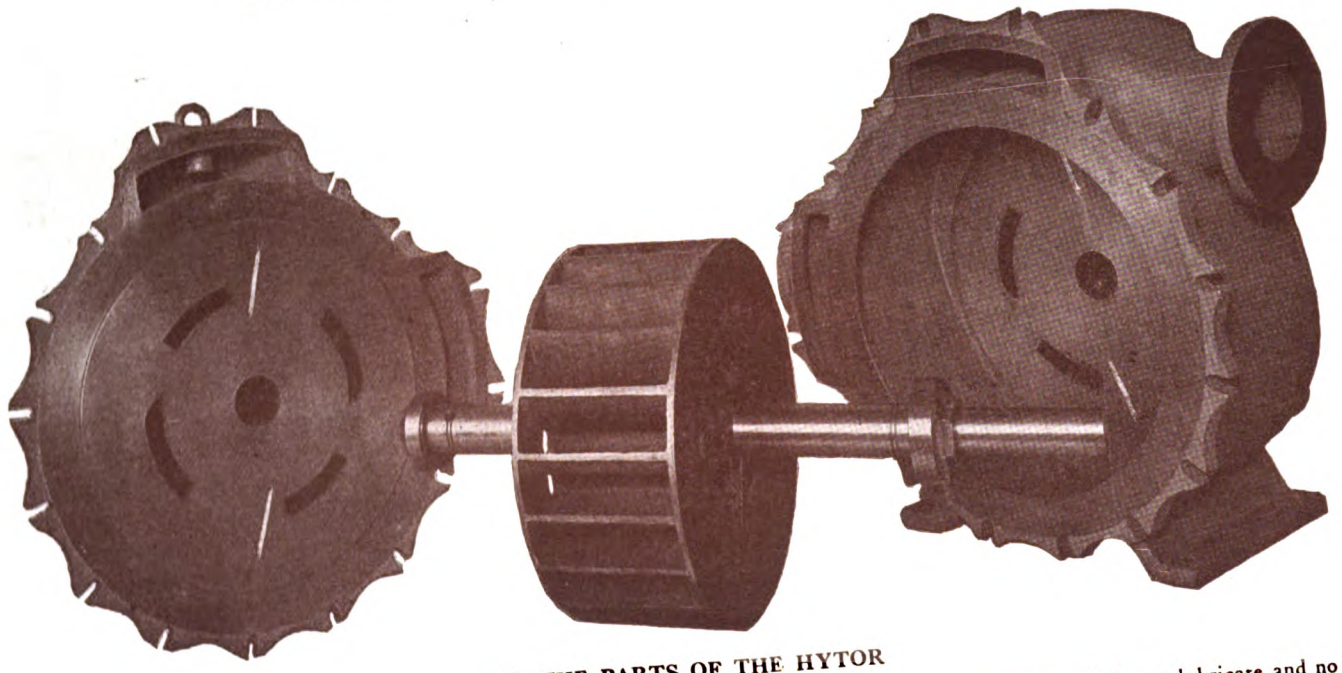
Company .....

Ind. Ill. June 1923

Digitized by Google

NASH HYTOR

THE ECONOMICAL AIR COMPRESSOR AND VACUUM PUMP



ALL THE PARTS OF THE HYTOR

THE HYTOR COMPRESSOR is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

The rotor, the only moving part, is cast in one piece, the blades being rigidly reinforced by shrouds. The rotor is mounted on a short, stiff shaft supported at each end by the highest grade annular ball bearings mounted outside of the casing.

As the peripheral clearance is large, there is no possibility of the ends of the rotor blades coming in contact with the casing.

The original high efficiency is maintained indefinitely in continuous service.

The air is thoroughly washed during compression and contains no oil.

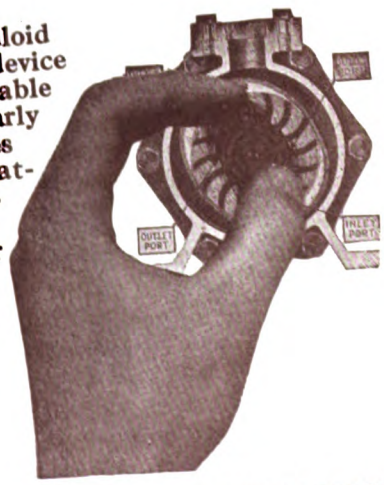
Hytor compressors occupy very much less floor space and are much lighter in weight than reciprocating compressors They run without vibration.

The cost of installation is greatly reduced as no expensive foundations are necessary.

No expert attendance is required as there are no adjustments to make. The cost of upkeep is negligible.

Hytor compressors are quiet in operation.

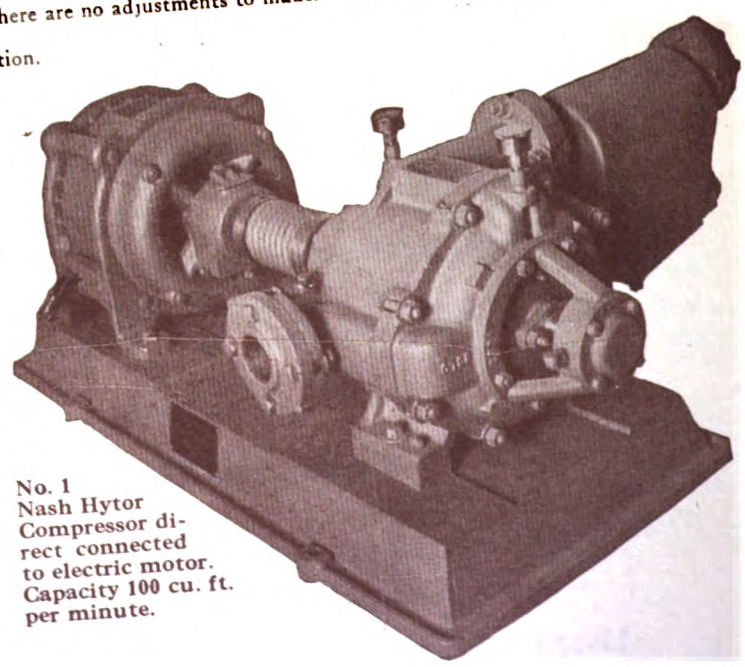
This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.



At pressures up to and including 15 lbs. per square inch, and vacuums up to 20 inches of mercury, the Nash Hytor affords the simplest and most economical means for handling air or gas, for all of the usual purposes where air under pressure is required, and they can be used on many special services for which the ordinary compressor is not adapted.

It is common practice in handling mildly acid vapors to re-circulate thru the pump an alkaline solution for the protection of the cast iron structure of the pump. In handling chlorine gas, concentrated sulphuric acid is re-circulated.

Air handled by the Hytor is delivered absolutely clean and free from dust or oil; a great advantage in the agitation of good products or in absorption processes where diffusion of air is accomplished by blowing thru filters, porous blankets or small orifices.



No. 1 Nash Hytor Compressor direct connected to electric motor. Capacity 100 cu. ft. per minute.

3

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U.S.A.

Please send graphic device also bulletins covering

- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps
- ☐ Return Line Heating Pumps
- ☐ Boiler Feed Pumps

NAME.....
POSITION.....
COMPANY.....
ADDRESS.....

NASH ENGINEERING CO.
SO. NORWALK, CONN., U. S. A.

Digitized by Google

Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees,
Associate Editor

Adolf Schildkraut,
Art Director

EDITORIAL

The March of an Idea

MEN'S reactions to ideas are what make life so complicated, and at the same time so interesting. Since the world began, there has probably been no single idea which, promulgated or translated into action, did not meet with as many different receptions as there are types of minds. Given any specific idea, the artist asks, "It is beautiful?"—the scientist, "Is it proved?"—the business man, "Is it profitable?"—and the engineer, "Is it practical?"

Two years ago INDUSTRY ILLUSTRATED was but an idea—the idea of making graphic and humanly interesting the tremendous drama of industrial progress. A drama which, of overshadowing effect upon civilization and the lives of men, has yet failed of full appreciation because it had never before been presented dramatically.

As with any idea, no matter how dynamic its apparent possibilities, no human intelligence could foresee the reception that would be accorded this new venture in industrial journalism. Enthusiasm alone cannot establish a publication; it must, first of all, fulfill a definite need.

The present issue marks the twentieth milestone in the life of this magazine. Just twenty months ago—in November, 1921—INDUSTRY ILLUSTRATED made its first appearance. Anticipating a certain amount of interest on the part of our readers, yet we confess ourselves both gratified and astonished not only by the volume, but by the quality of this response.

We believed that practical, busy men would be interested in *seeing,* rather than merely reading about the men and methods and machines that are advancing civilization by leaps and bounds—and that belief has been borne out by hundreds of letters from the very men who control and direct this progress.

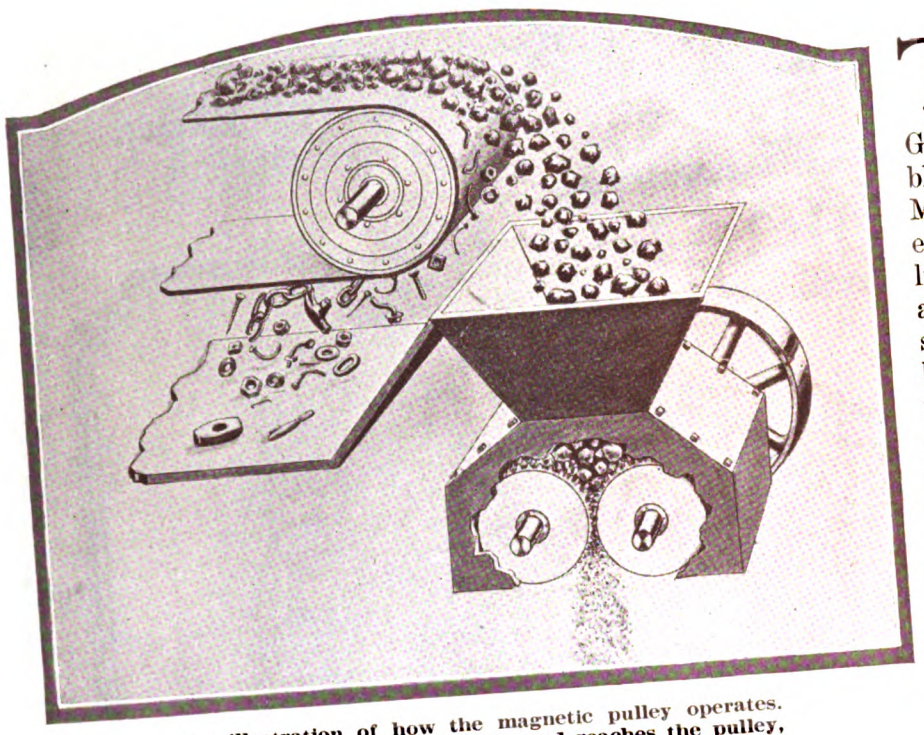
In fact, the response has been cumulative, and progressively more impressive as the months rolled on. To such an extent that we deem it only fitting to share our gratification with those who helped make it possible—our subscribers and advertisers. Beginning with less than two thousand subscribers, and carrying the endorsement of less than two-score advertisers, these twenty months have witnessed a ten-fold multiplication in the one case, and a three-fold multiplication in the other.

Without this whole-hearted cooperation, we could not in so short a time have made INDUSTRY ILLUSTRATED what it is. With this cooperation, and further stimulated by the constant evidence of live interest on the part of our readers, we can go forward with confidence, toward the goal we have set ourselves.

Digitized by Google

Magnetism and
Their Application and Use

By R. A.



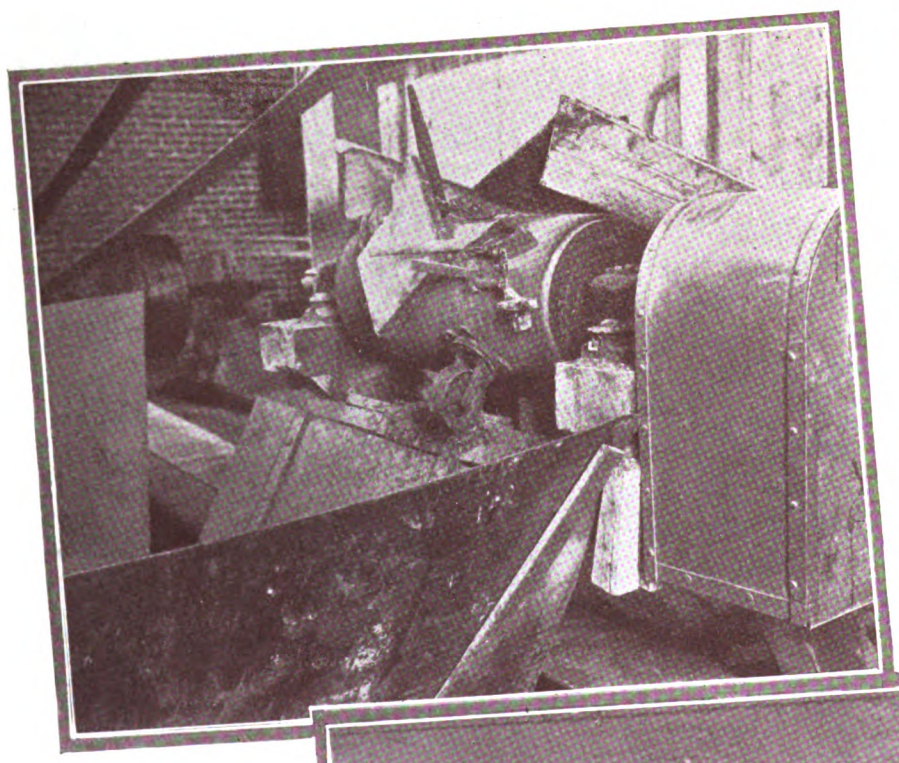
An illustration of how the magnetic pulley operates. When the material to be separated reaches the pulley, the iron and steel particles are drawn downward, away from the discharge point.

THE phenomenon of magnetism was known 3,000 years ago. The ancient Greeks discovered that the black stones in the vicinity of Magnesian in Lydia had properties different from others of like appearance, in that they attracted iron and were themselves attracted to each other by an invisible force. Many myths and legends, were told of the powers of these stones. Some thought they possessed healing qualities, others believed that diamonds could be located by them, for it was thought the stones lost their attraction in the presence of diamonds; the possibility of locating sunken treasures if large and powerful enough stones could be found was thought of, and many like hallucinations. "Magnet" derives its name from its original point of discovery—"Magnesian."

About 800 years ago it was found that by taking a piece of this black rock or lodestone and shaping it rectangular or oblong, that one end would always point toward the same direction when the piece was supported to move freely. Mariners soon recognized the value of this discovery, and the compass, of invaluable service, is the result. The divining rod, supposedly for locating mineral deposits followed next.

Magnetism and electricity are closely related but neither has revealed its identity. We use both in many ways and for many purposes, and it is the object of this discussion to dwell mainly upon the practical application of electro magnets as applied in industry.

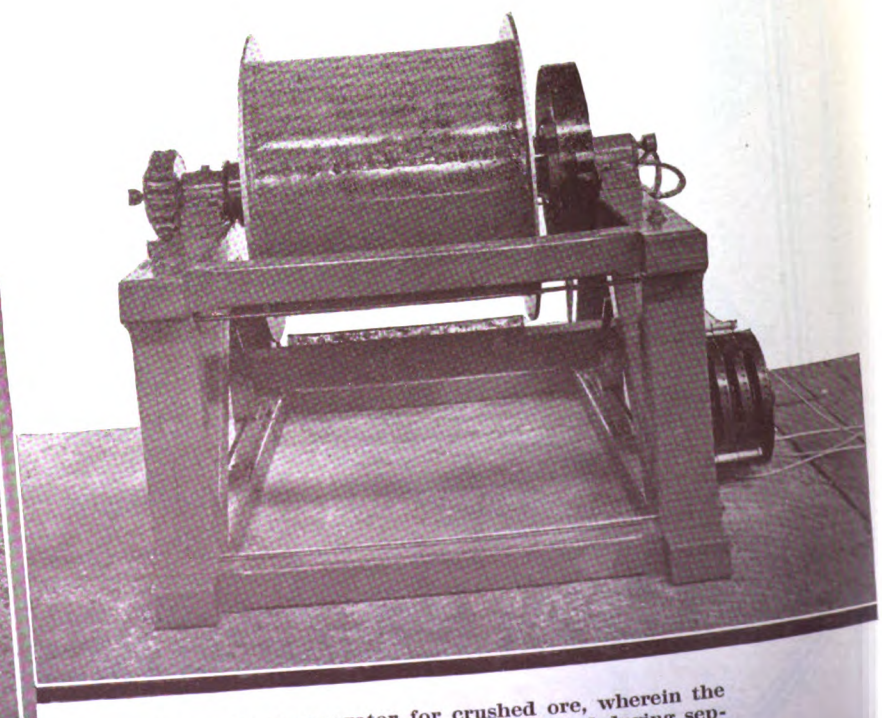
Modern science and thought explains the phenomena of magnetism by means of the molecular theory. Molecules have shape and dimension. A magnetized body is one whose molecules all arrange themselves, wholly or in part, so that all the little poles of the molecules point in one direction. The molecules assemble themselves in parallel directions with north poles pointing all one way and south poles in the other. Some substances retain the molecules in this po-



At the left is shown an actual installation of a magnetic pulley removing tramp iron, at the Canada Glue Co.



At the right—some idea may be gained from this illustration of the variety of unwanted material separated by magnetism.



A wet drum separator for crushed ore, wherein the finely crushed ore is thoroughly agitated during separation; the water preventing entanglement of particles.

Digitized by Google

Magnetic Separators

in Industrial Development

MANECOLD

sition while others, when this invisible force is removed, again return to their original state of rest. As a consequence, we have magnets of more or less permanent magnetic strength. The combined little molecular magnets go to make up the one large magnet.

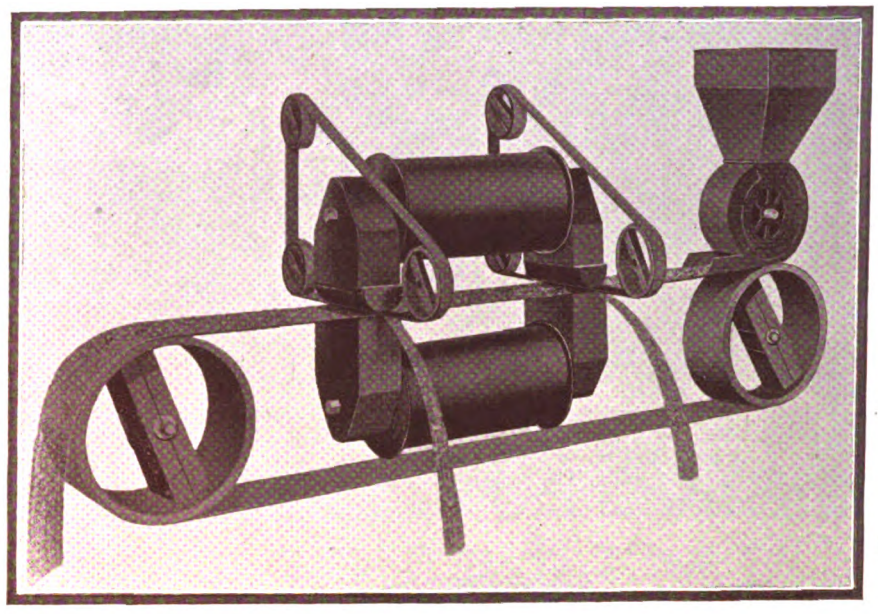
An electro magnet is a combination of a coil of wire with a core composed of iron or steel. When current is passed through the wire, it is surrounded by invisible lines of force. These lines emanate in all directions but are collected in the core because less resistance is there offered than by the surrounding air. Each molecule of the core becomes an independent little magnet with North and South Poles and combine together to make up the one large magnet.

A magnetic separator is a combination of one or more electro magnets operating in conjunction with mechanical appliances. Where magnetic material and non-magnetic material are mixed, be it coal with tramp iron; iron ore with rock; non-ferrous borings such as brass, aluminum or bronze and iron borings or ferrous borings; grains and cereals with bits of iron; potters slip and clay with specks of native iron, etc., the magnet serves to attract that portion which is susceptible, and the mechanical means serve then to deflect or carry it out of the general direction of flow.

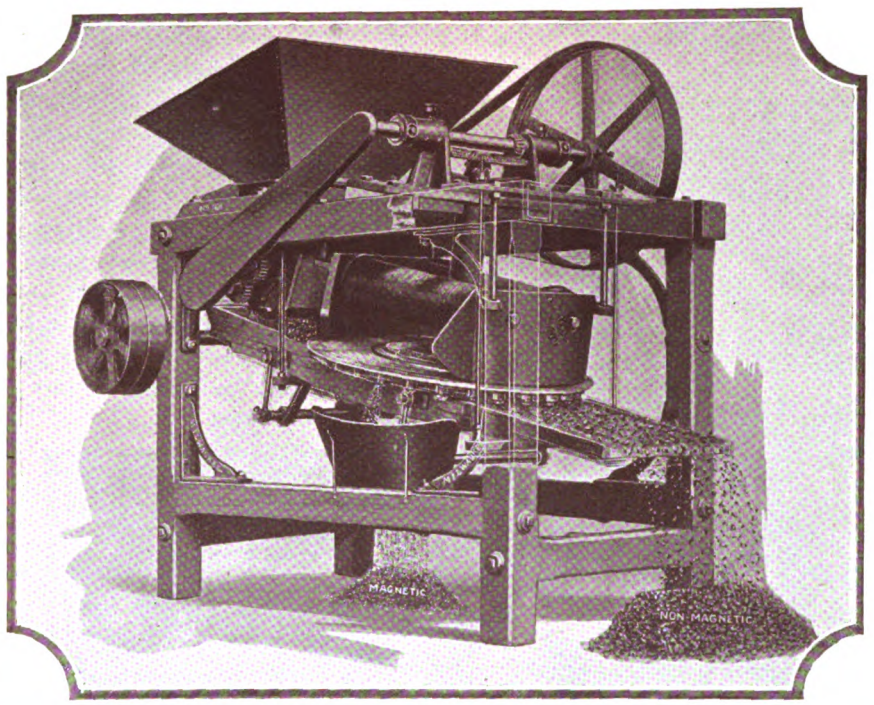
The problems encountered with magnetic separators can broadly be classified in three general groups:

1st—The removal of tramp iron before grinding or crushing.

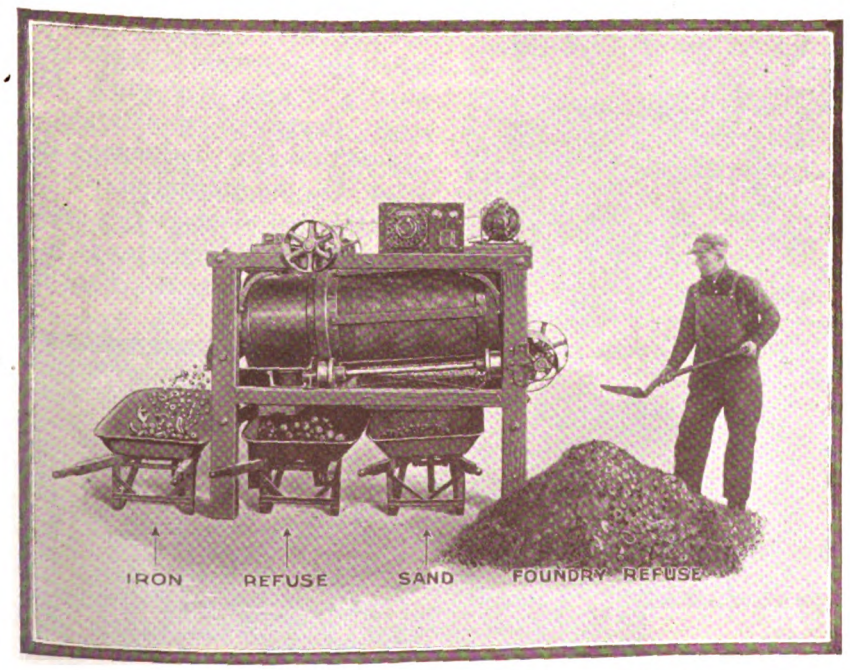
(*Continued on page 61*)



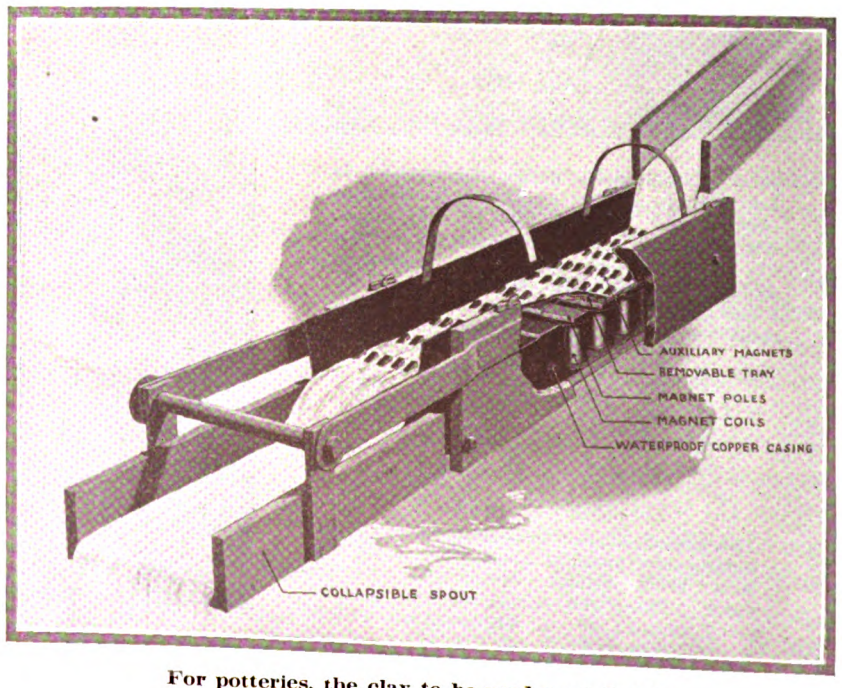
Above is an illustration of the principle of operation of a high intensity Cross Belt type separator, which removes magnetic material from a passing belt.



In machine shop practice, where bronze and brass borings to be remelted must be free from iron borings, the separator shown above is often used. The borings are fed into a hopper which insures even feed upon an inclined shaker; the magnet deflecting the iron particles as shown.



Revolving screen separator, with magnet at the lower end. This type is used in iron foundries to reclaim metal from waste, after the reclaimable sand has first been screened and salvaged.

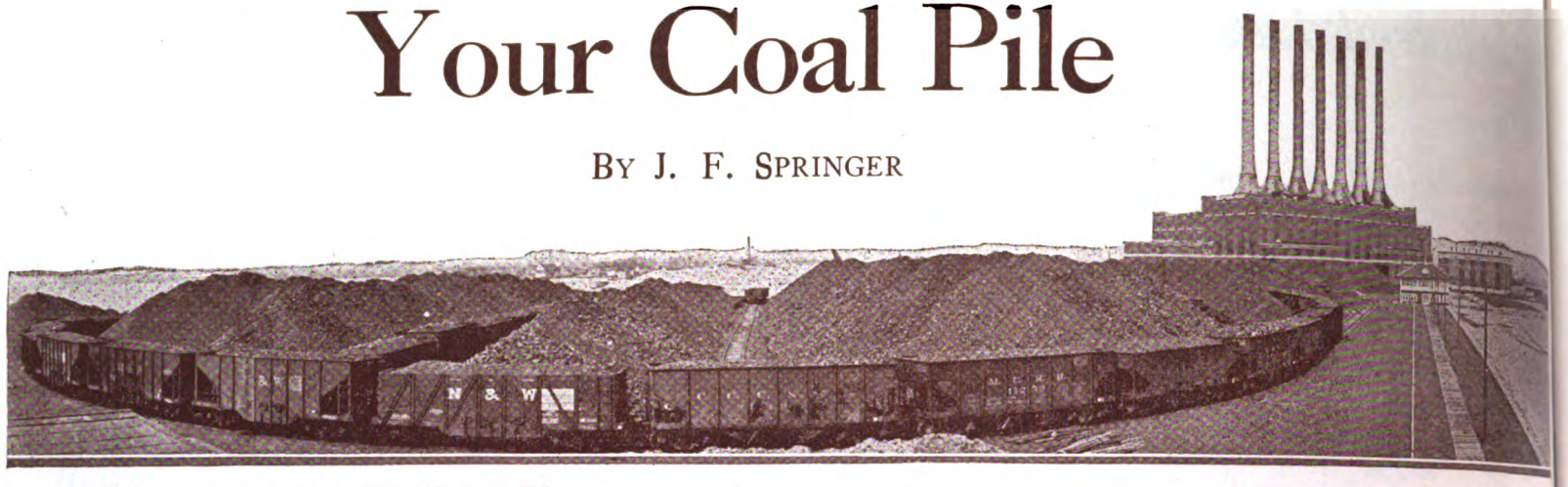


For potteries, the clay to be used must first be freed from iron particles (which cause blue specks and blisters). The clay, made liquid with water, is run through a trough equipped with a separator, as shown above.

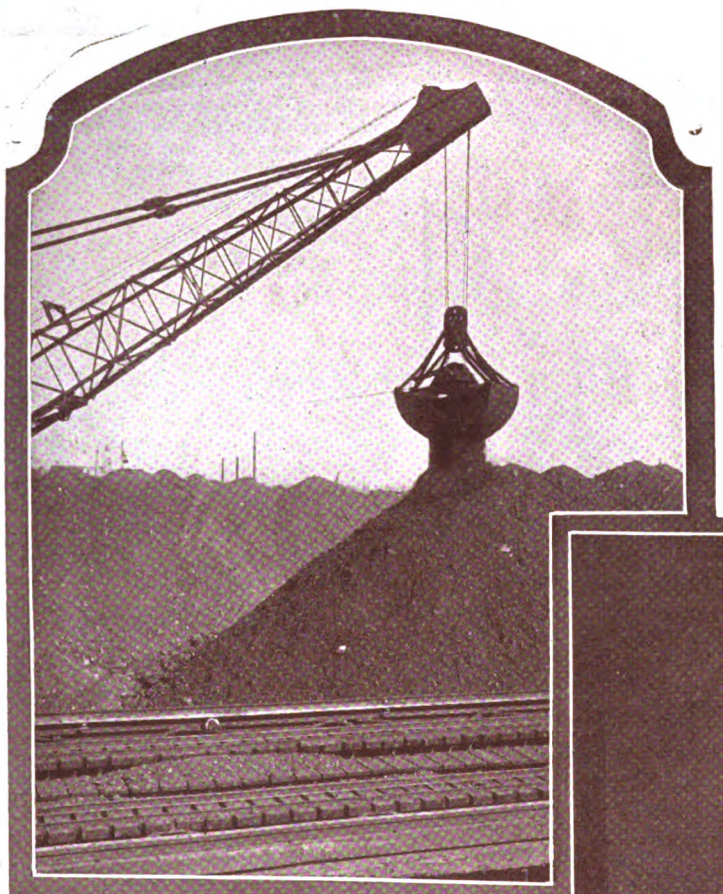
Digitized by Google

Keeping the Fire Demon Out of Your Coal Pile

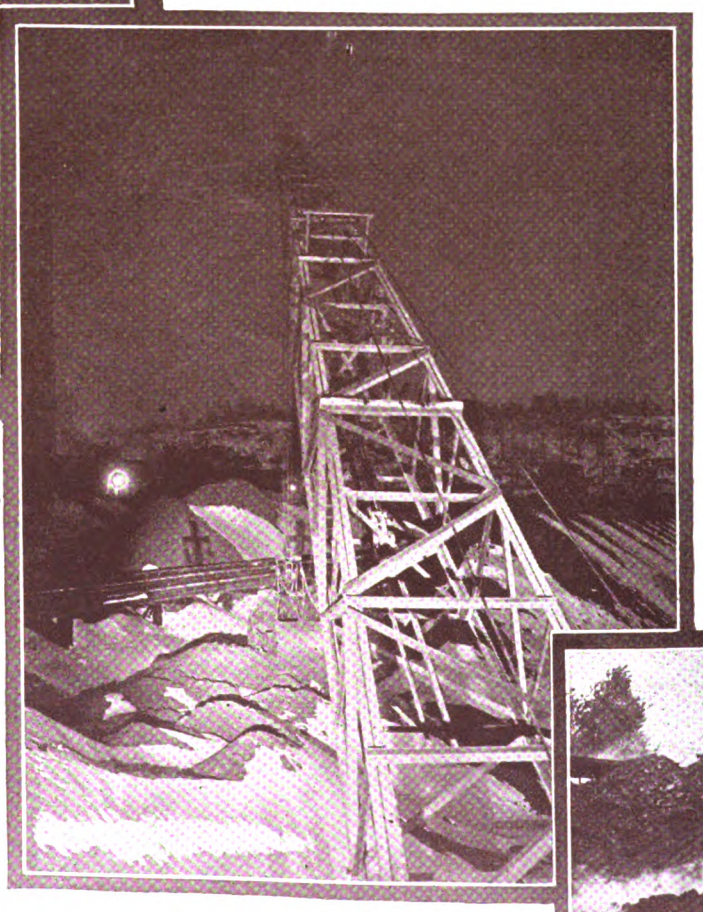
BY J. F. SPRINGER



It is in places such as this (Detroit Edison Co., as typical of central station coal storage) that spontaneous combustion must be especially guarded against.



Storing coal in a "ridge pile," which is kept within a fixed maximum height; to prevent too large a pile in one place, and to permit access to every part. One of the accepted preventive measures against spontaneous combustion, is to have no part of the stored coal more than ten feet away from the air-cooled surface.



The great one-hundred-foot boom of the locomotive crane of Shadyside, N. J., the New York Edison Company's storage yard. This was taken at night, and gives an idea of the illumination which permits constant supervision by night as well as by day.



A coal fire that has worked its way to various parts of the pile; a difficult problem to handle.

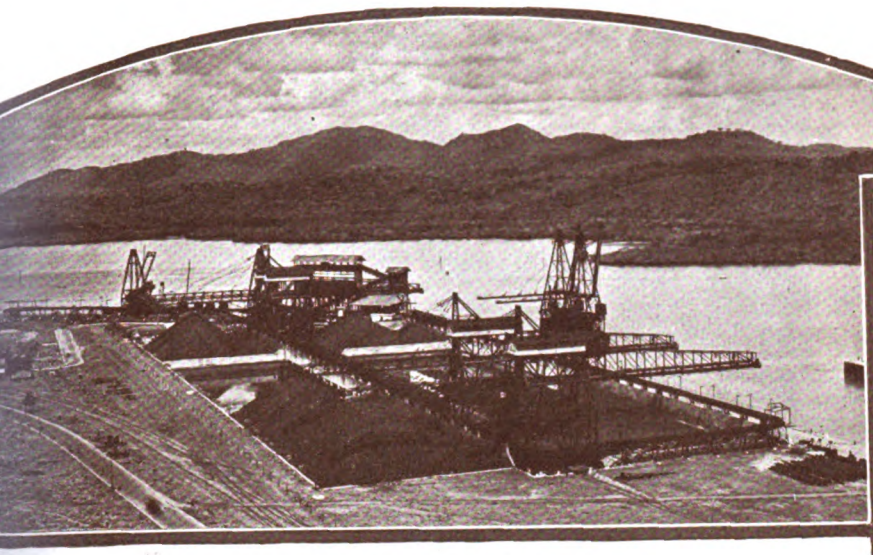
IT has not been so long since the spontaneous combustion of coal was in effect regarded by intelligent people as something to be classed with sea-serpents, fairies, and the like. The intellectual view was that self-ignition did not occur, and that stories of coal-laden ships sailing for distance ports but never arriving because the coal had fired itself were nothing but examples of loose talk. Perhaps some of the ships had gotten afire and had in consequence gone down, but some one had dropped a lighted match or thrown a lighted cigar into the coal. They refused to believe that a mass of coal could get on fire without human help.

Apparently, however, the stories persisted and became too numerous and well supported by other facts to permit unbelief to maintain itself quite so stiffly. At any rate, during recent years a change has come about in respect to the belief in the self-ignition of coal. This phenomenon is now known to be a frequently occurring one.

As a matter of fact, the spontaneous ignition of a coal pile is often, or ordinarily, a matter of some mystery. It is not the normal thing that the fire begins on the surface and eats its way down and around. On the contrary, a very typical way for a fire to begin is deep down in a big mass of coal. The reader may wonder how this can be. Can a fire really get started twenty feet below the top of a thirty-foot pile? And, if it does start, where will the necessary oxygen come from to keep it going? These are pertinent questions, and ones that the reader may think ought to be answered.

It is believed at the present day that air circulates in a pile of bituminous coal. That is, it

Digitized by Google



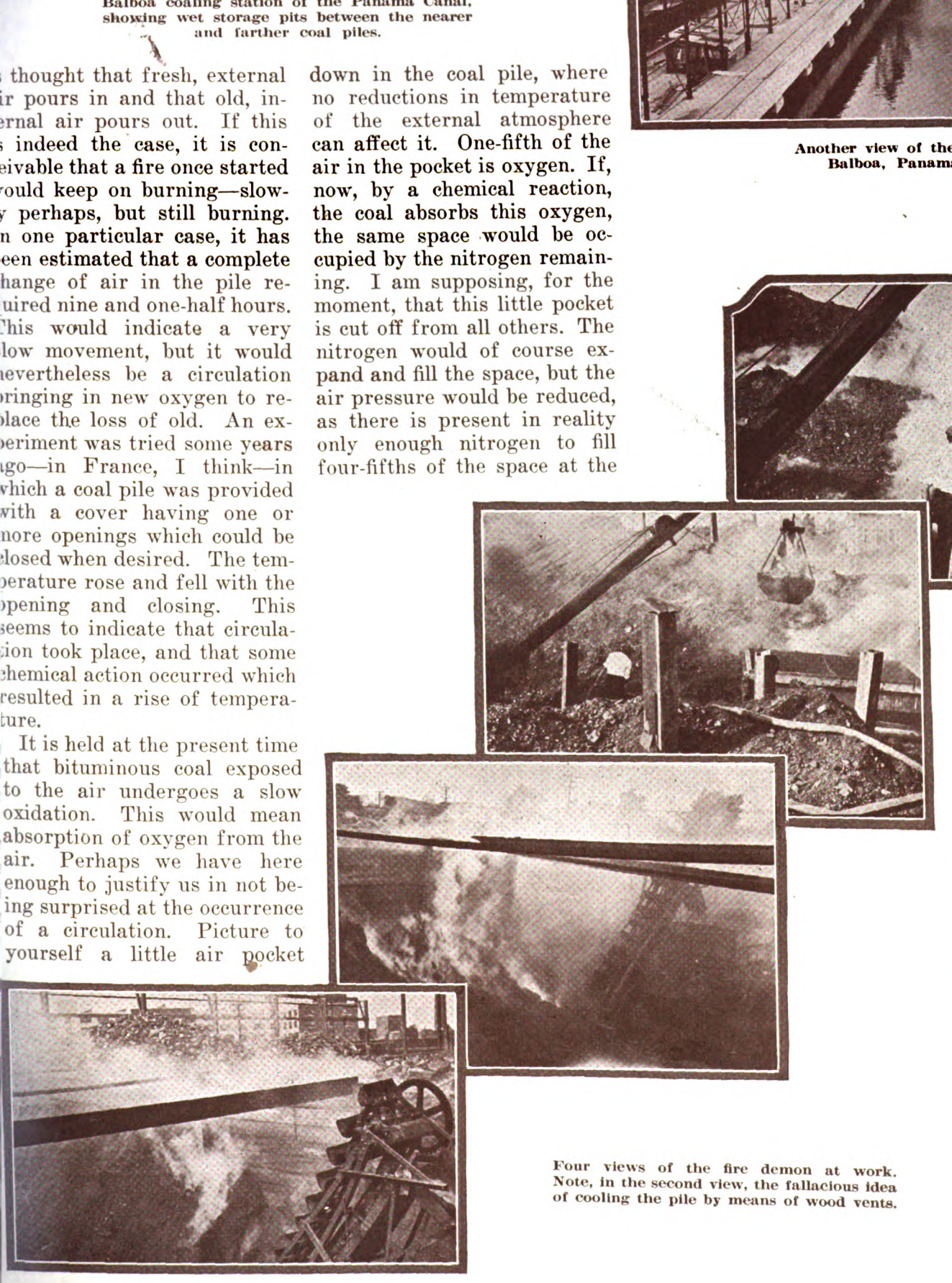
Balboa coaling station of the Panama Canal, showing wet storage pits between the nearer and farther coal piles.



Another view of the wet storage pits for coal at Balboa, Panama Canal coaling station.

thought that fresh, external ir pours in and that old, in- ernal air pours out. If this s indeed the case, it is con- eivable that a fire once started vould keep on burning—slow- y perhaps, but still burning. n one particular case, it has een estimated that a complete hange of air in the pile re- uired nine and one-half hours. This would indicate a very low movement, but it would nevertheless be a circulation bringing in new oxygen to re- place the loss of old. An ex- periment was tried some years ago—in France, I think—in which a coal pile was provided with a cover having one or more openings which could be closed when desired. The tem- perature rose and fell with the opening and closing. This seems to indicate that circula- tion took place, and that some chemical action occurred which resulted in a rise of tempera- ture.

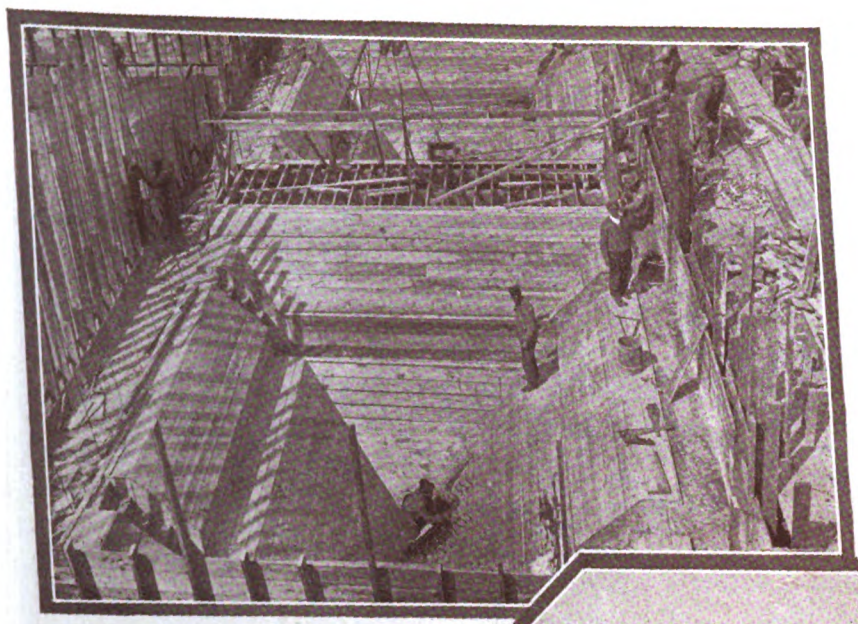
It is held at the present time that bituminous coal exposed to the air undergoes a slow oxidation. This would mean absorption of oxygen from the air. Perhaps we have here enough to justify us in not be- ing surprised at the occurrence of a circulation. Picture to yourself a little air pocket down in the coal pile, where no reductions in temperature of the external atmosphere can affect it. One-fifth of the air in the pocket is oxygen. If, now, by a chemical reaction, the coal absorbs this oxygen, the same space would be oc- cupied by the nitrogen remain- ing. I am supposing, for the moment, that this little pocket is cut off from all others. The nitrogen would of course ex- pand and fill the space, but the air pressure would be reduced, as there is present in reality only enough nitrogen to fill four-fifths of the space at the normal tension of the external atmosphere. In short, it would appear that withdrawals of oxygen result in a partial vacuum. Outside air would then enter.



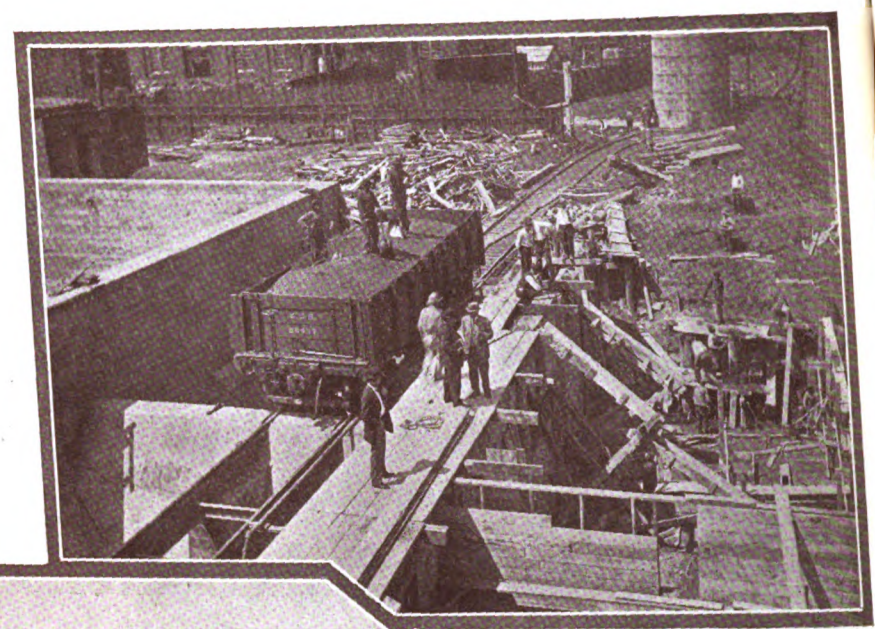
Four views of the fire demon at work. Note, in the second view, the fallacious idea of cooling the pile by means of wood vents.

Doubtless, this is only part of an explanation and does not explain the exit of the nitro- gen. The nitrogen, perhaps, rises because the specific gravi- ty is less than that of natural air. Thus, when air has the specific gravity of 1.000, nitro- gen has that of 0.972. Conse- quently, we should expect an upward return current of ni- trogen passing alongside of or through a downward current of atmospheric air. It would appear then that the circula- tion in a coal pile consists of innumerable small currents all seeking to flow down or up. Whether this is the right ex- planation or not, investigators are satisfied of the existence of some kind of circulation.

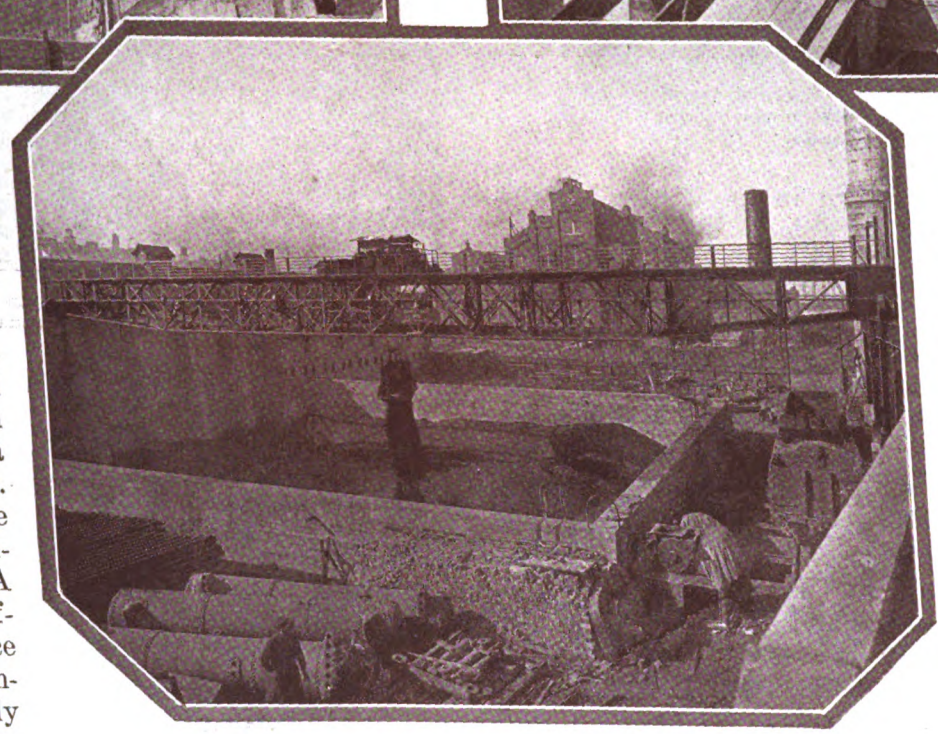
Digitized by Google



A wet storage concrete pit at Omaha, owned by the Nebraska Power Co., Omaha, Nebraska.



Coal cars here deliver either to conveyors for immediate use, or to wet storage pit.



Below—Night view, showing illumination of coal piles at Shadyside, N. J., the New York Edison Company storage yard



Now it appears that when coal absorbs oxygen, the temperature rises. This is in fact what usually occurs when oxygen unites with another substance. In short, in the coal pile we have a slow combustion going on and this produces a small but real amount of heat. It appears also that when the temperature is higher, the oxidation becomes more active. A little reflection will now be sufficient, perhaps, to convince the reader that with the temperature being continually added to and the oxidation going on faster and faster, a time might come when the ignition point would be reached and the coal would begin to burn in the ordinary sense.

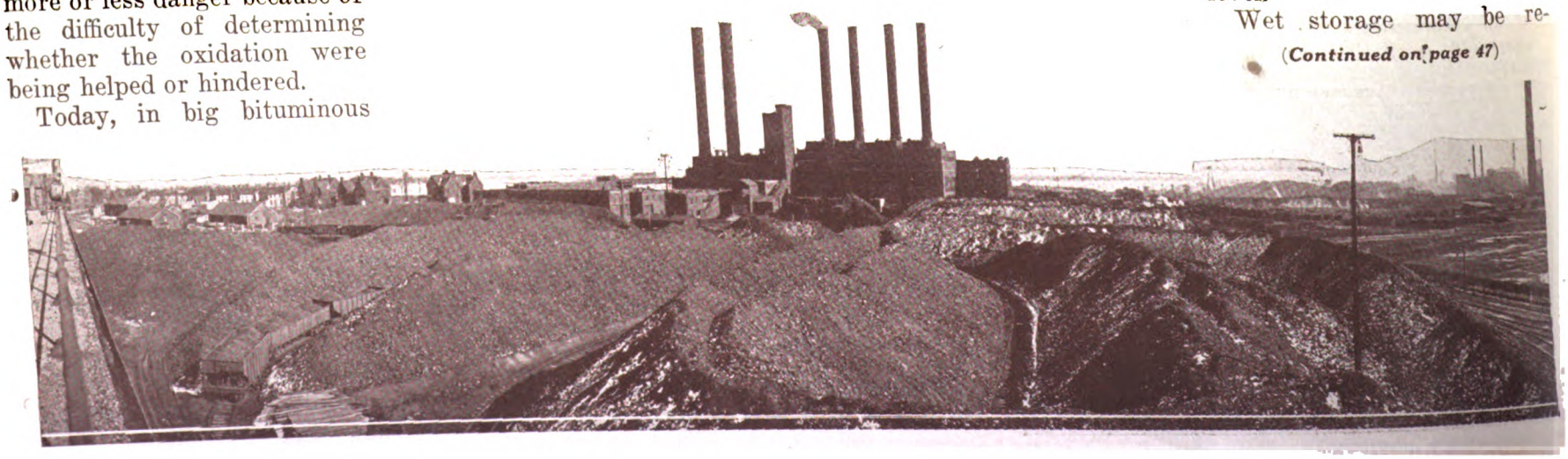
Apparently, it is possible to circulate air artificially through a pile in such quantity as to keep the temperature down and prevent ignition. This would then be a case where the cooling effect overcomes the progressive oxidation activity. As a matter of fact, the artificial circulation of air as a means of forestalling spontaneous ignition would seem to be fraught with more or less danger because of the difficulty of determining whether the oxidation were being helped or hindered.

Today, in big bituminous coal yards, spontaneous ignition is no fairy tale, but a grim reality. The Canadian Pacific Railway had great difficulty in controlling the menace and the actual occurrence of the self-ignition of the great storage piles at Montreal. This was some years ago. The coal came from Nova Scotia and was piled in Montreal in the warm season. No trouble seems to have occurred in the storage at the mines preparatory to shipment by boat when the St. Lawrence was open for navigation.

It may be considered certain that spontaneous ignition can be prevented (1) by shutting off all circulation of air through the pile, or (2) by keeping the temperature throughout the pile at a low level. This is one simple method of storing coal which accomplishes both things at once. That is, if the coal be submerged under water, no spontaneous combustion can get started. Oxidation will either not take place at all or be negligible in amount; and evidently the temperature will be kept far below any ignition level.

Wet storage may be re-

(Continued on page 47)



Digitized by Google

Do We Need More Foreign Labor?

Secretary of Labor James J. Davis, on Immigration

IN view of the increasing shortage of common labor, and the agitation for a repeal of the present restrictions on immigration, many of us lose sight of the really important problem—the problem of America as a Melting Pot. It is this fundamental problem that our Secretary of Labor has in mind when he says:*

"I propose that we establish strict, but just tests of physical and mental health, and that we make those tests under the numerical restriction now placed by law on immigration. I would have those tests made abroad in order that the applicant for admission may not have to spend the savings of a lifetime on a long sea voyage, in order to find out whether he can enter the United States. The Solicitor of the Department is now inquiring into the possibility of moving our whole examining machinery to foreign countries under our present laws. I feel that nothing would so strengthen our whole immigration policy.

"It is a short sighted policy to seek cheap labor through immigration. Today, because of the demand for workers, there is a perceptible movement of common labor of a low grade from a contiguous country. Large groups of this nationality are finding their way into our mills and factories. I have talked with employers who have taken on these men, and in every case they admit that an upstanding American workman would do two and one-half times the work that is accomplished by the individual of this racial group. That being so, it is quite apparent that it is cheaper to pay an American worker twice the wages which the foreigners receive. It has been my experience since the days when I worked in the mills that cheap labor is expensive labor, both for the industry which employs it, and for the community which houses it."



The Honorable James John Davis, Secretary of Labor, was born in Tredegar, South Wales, in 1873. Coming to the United States with his parents in 1881, he began as a puddler's assistant in the iron works at Pittsburgh, at the age of eleven, and was a puddler at sixteen. Moving to Elwood, Indiana, at the age of twenty, Mr. Davis worked in steel and tin plate mills there. He became City Clerk, and later, Recorder of Madison County; director-general of the Loyal Order of Moose; president of the American Bond and Mortgage Company of Pittsburgh; Secretary of Labor in President Harding's Cabinet————to mention but the highlights of a splendid and typically American career.

* Our Labor Shortage, and Immigration—INDUSTRIAL MANAGEMENT, June, 1923.

Digitized by Google

Painting the Factory

How and When to Paint—and Why

BY REGINALD GORDON

THE appearance and permanence of factory buildings depend largely upon paint. A group of buildings that present a new, clean aspect give a certain tone to a plant whether large or small; and the impression that a stranger receives on approaching such a place may have considerable influence on his attitude in entering upon negotiations with the management. Even the effect of a neat, well painted building upon the casual traveler passing the plant should not be overlooked. Wooden buildings require frequent repainting; galvanized iron roofs and sidings must be kept painted to resist corrosion; brick and concrete walls, even when not painted, are set off to better advantage by regular paint maintenance of the doors, sash, cornices, etc.

Paint is a preservative, and for this reason progressive executives are careful to keep their buildings and other plant structures well painted. Since the labor cost is the largest item in the total expense of a painting job, certain factors must be taken into consideration when an outlay of money for this purpose is to be made. These are: (a) the minimum number of gallons of paint required to do the job properly; (b) the minimum cost; (c) the minimum man hours of labor (d) the durability or life of the paint after it has been applied; and (e) the appearance of the finished work.



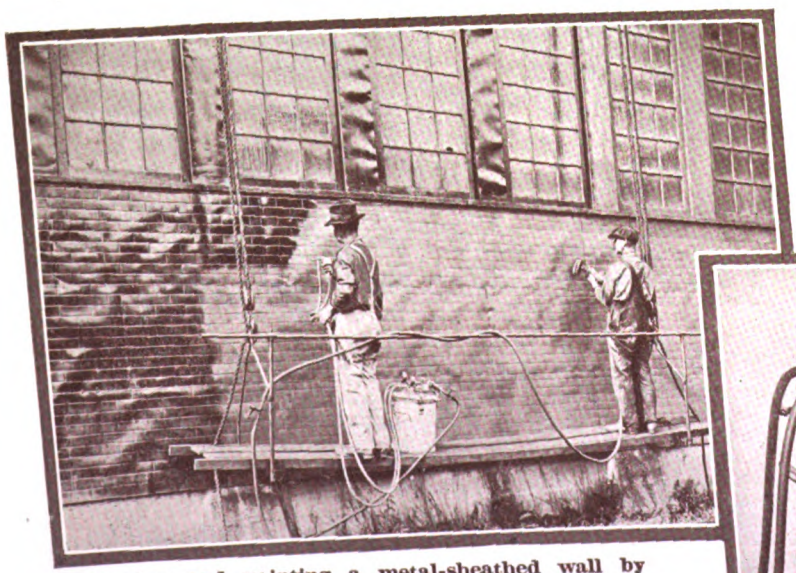
The painter shown here is applying a coat of paint especially adapted to protection of steel work.

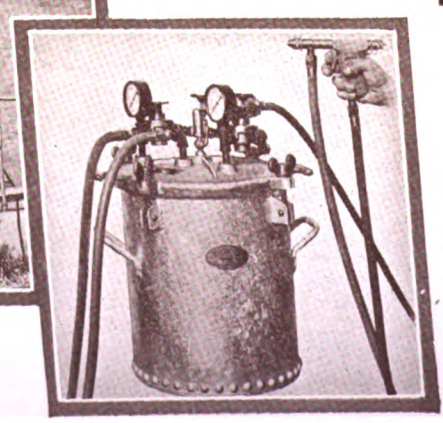


This group of steel buildings was cleaned off with air-driven wire brushes and painted with air brush apparatus in 100 working days.

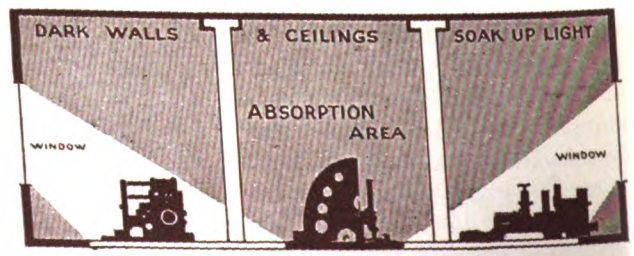
Money spent for painting is an insurance premium and a necessary outlay against deterioration. Deterioration is an inevitable even if slow process of destruction, for it is slow, very slow combustion. Everything exposed to the air oxidizes more or less; therefore in preventing this process by painting our buildings we are buying insurance against sure but slow burning, exactly as we buy fire insurance against rapid burning which perhaps may never occur. We almost never take a chance on the occurrence of an actual fire; but often we let buildings burn slowly by allowing them to decay, rust, weaken and deteriorate by failing to keep them painted.

For outside work, the choice of a paint material depends upon the climate of the particular location, exposure to salt-laden air, acid fumes, smoke, etc. But wherever used, a paint for exteriors must so cover the surface, and to a certain extent penetrate it as to prevent access of air, which means access of oxygen and moisture. Wood softens and decays, steel corrodes, brick, stone and concrete absorb moisture. So there is always some part of the plant buildings that calls for the pro-

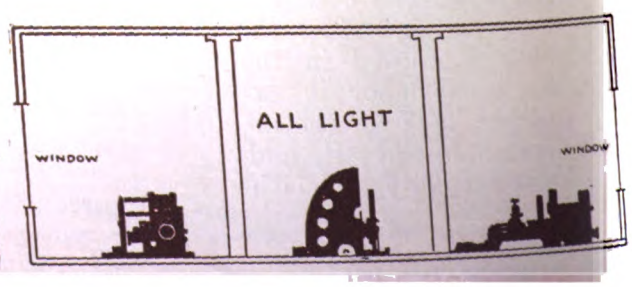




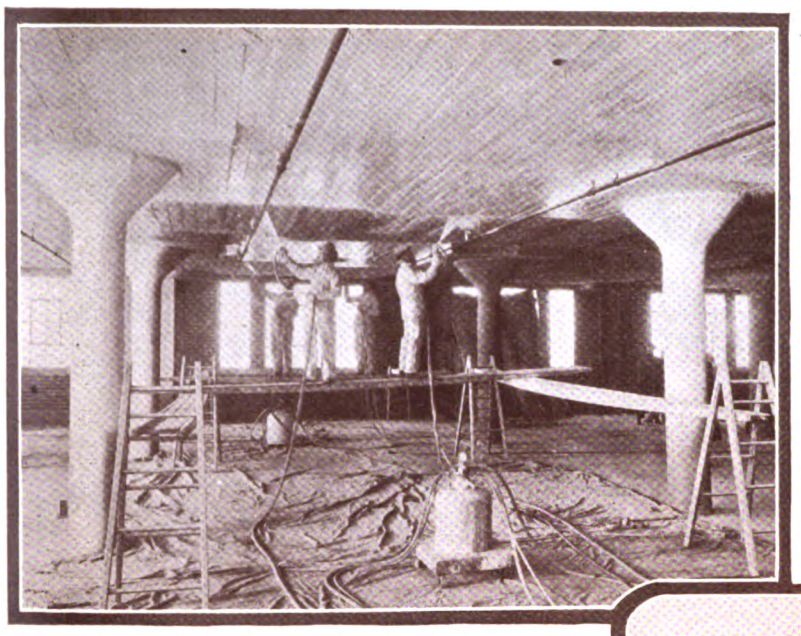
Cleaning and painting a metal-sheathed wall by means of an air-driven wire brush and a paint gun. The cylindrical reservoir on the scaffold contains the paint and a close-up of it is shown on the right of the picture.



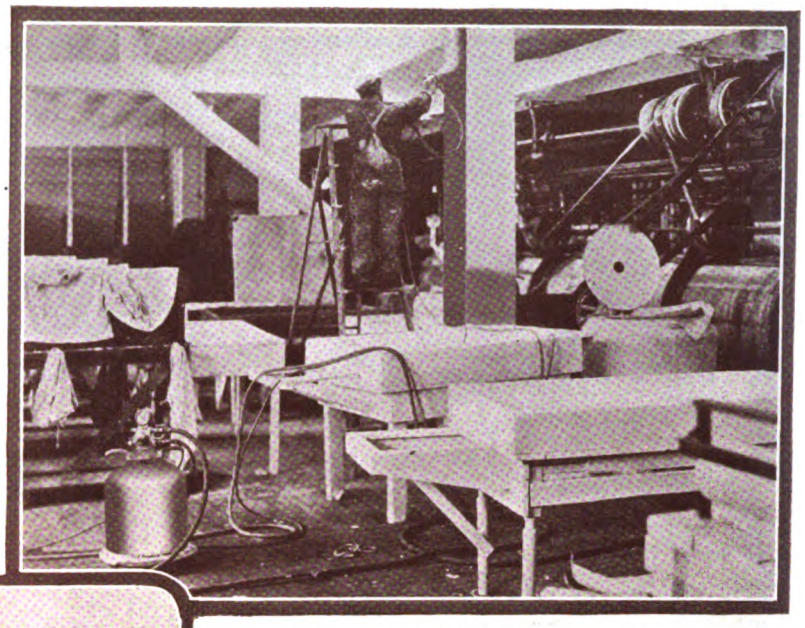
These two diagrams illustrate the possibilities of improving the illumination of a machine shop by painting walls and ceilings white.



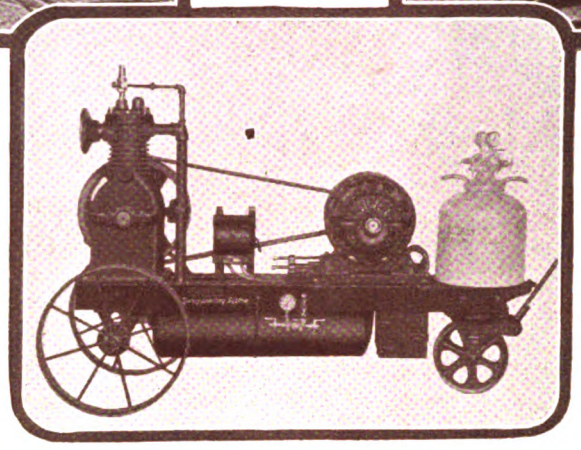
Digitized by Google



Portable equipment for spray painting. Note that one set can be used for two or more painters.



Note how easily the spray nozzle enables the painter to work around corners and inaccessible places.



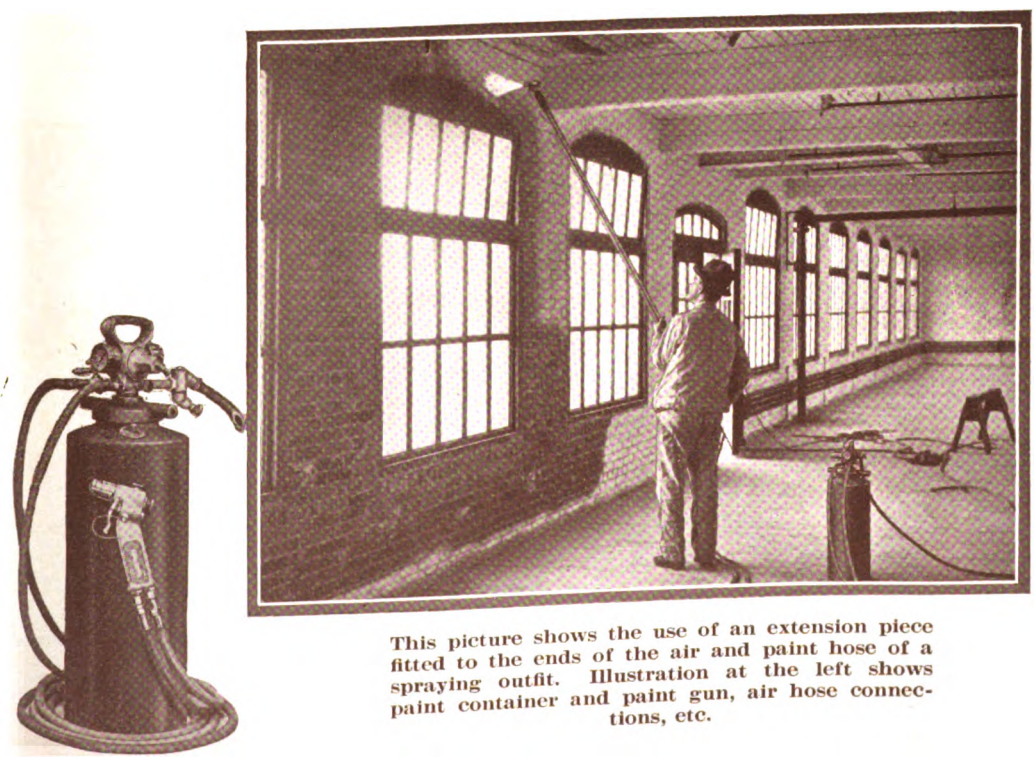
This equipment can be pulled about to any part of the plant, wherever a supply of electricity for the motor is available.

tection afforded by paint. Saving money by neglecting to paint factory buildings results in giving a poor impression of the company to employees as well as to strangers; and what is equally bad, unpainted buildings deteriorate rapidly.

Paint in general is made up of two chief constituents: a base, commonly white lead, and a vehicle which mixes with and carries this material. A volatile constituent, usually turpentine, is also added for the purpose of making the paint flow more easily when brushed on. The vehicle in commonest use and that which experience has shown to be most satisfactory is linseed oil. Coloring matter or pigment added to a paint gives it the desired hue or color, but does not constitute its permanent basis. After paint is applied, the drying of the oil, when the mixing has been properly done forms a tough, slightly elastic coating on the surface, holding the pigment and coloring matter in place.

For the best results, it is generally agreed that the most useful and durable bases for paint are white lead (lead carbonate) and zinc oxide. For certain purposes, however, especially on steel work, red lead and iron oxide are found to be best adapted. In addition to white lead and white zinc there are substances on the market sometimes used as substitutes for these and often mixed with them to a greater or less degree. These are called "extenders" or "spreaders." Many expert paint men maintain, however, that they add neither durabil-

These two pieces of timber were cut from the sill of an ice house built in 1893. Five years is the usual life of such timbers, but the end shown in the lower illustration has been painted with a preservative preparation, which accounts for its excellent condition.



This picture shows the use of an extension piece fitted to the ends of the air and paint hose of a spraying outfit. Illustration at the left shows paint container and paint gun, air hose connections, etc.

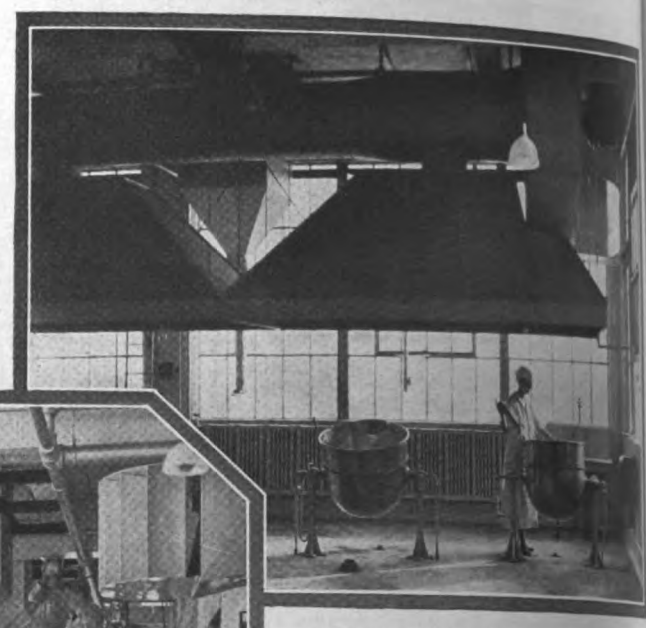


Another example of the convenience of compressed air painting equipment, where a 6-foot extension pipe enables the workman to reach any portion of the ceiling.

Digitized by Google



Notice the bright, uniform illumination furnished by the white painted ceiling and walls in this weave room.



These cooking kettles and the hoods over them, as well as the radiators are brightened up with aluminum bronze paint.



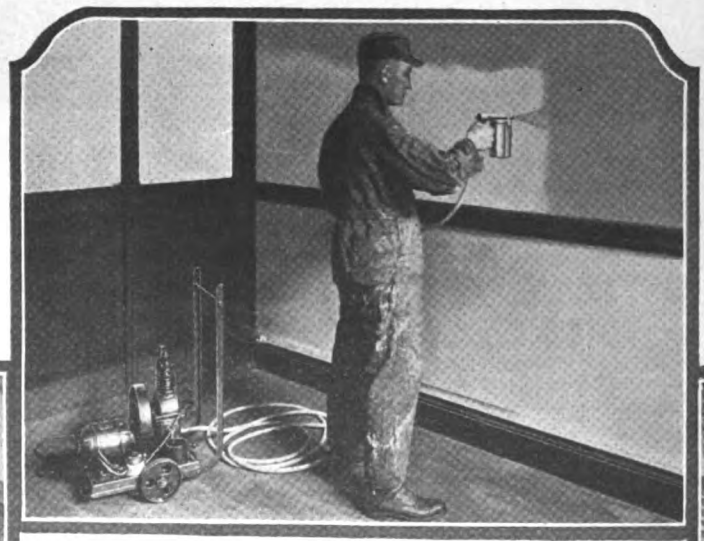
Covering machinery to protect it when ceilings are painted. Machinery need not be covered, when spray painting is employed

ity nor appearance to a job, because when mixed with the oil they weaken a color and tend to give it a grayish appearance. Most of these extenders are white, yet when mixed with linseed oil they look gray. Many low priced paints contain what is called "turpentine substitute," a volatile liquid that for many small jobs gives satisfactory results, and there are some substitutes for linseed oil; although these are not considered to be the most durable.

Whether out or indoors, all surfaces to be painted must first be cleaned in order to give a fresh, uniform area over which paint can be spread and on which it can secure a hold. Wood and plaster must also, especially if new, have a priming or filler coat that can, as the name implies, fill the pores of the wall or ceiling and on this the color or body coat is painted. From old walls, all dust, soot, oil and grease must be removed, otherwise the finished work will show spots and streaks. Structural steel work, metal roofing, etc., is usually primed with a coat of red lead or iron oxide, as these form a close bond with the steel surface and prevent its injury by corrosion.

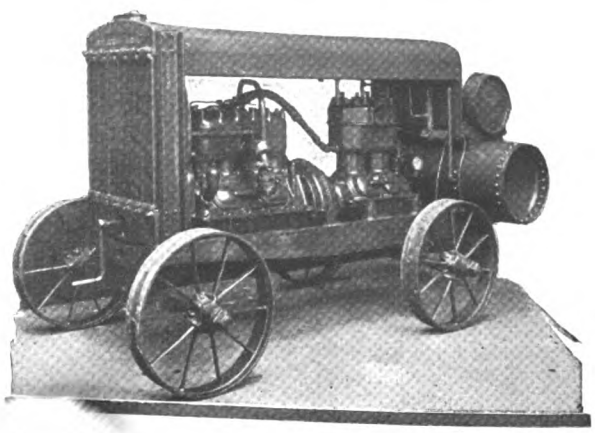
More careful attention is now given to the proper paint-

(Continued on page 75)



A useful portable painting set. The motor that drives the compressor can be plugged in at any electric outlet.

Below is a large portable set driven by gasoline engine, capable of supplying air to several paint sprays or cleaners equipped with wire brushes.





Painting overhead steel work without the necessity of drip cloths to protect parts stored below.



Another portable spraying outfit with motor-driven compressor.

Digitized by Google

Making Real Vacations Possible

Companies that Provide, Not Only the Time, but the Place

BY GEORGE W. GRAY



The swimming pool at Camp Sherwood, camp of the New York Telephone Company.



The Lake and the main buildings at Camp Isida, of R. H. Macy & Company.



Mothers are allowed to bring their children to the Swift & Company vacation camp at Fish Lake.

ONE hot day in August a motorist turned his car out of a smooth highway in northern Indiana to follow a less civilized but more enticing trail into the woods. Finally he came out of the forest on the shore of a lake. A soft breeze ruffled the waters and stirred the greenery of the trees—though back on the road there was only quivering heat. The motorist camped there that day and night, enjoyed some first-rate fishing, found the lake ideal for swimming, and got back to Chicago a few days later an enthusiast for his vacation find in the midst of the lonely woods.

Today that hidden lake is the center of a camp developed and maintained by a great industrial company. Shacks have been built, eating quarters provided, other vacation facilities installed, and hundreds of employees go there every summer. It all dates back to that August day and that exploring motorist who, as it happened, was a large employer of labor and had been troubled with the problem of getting his people really to use their vacations for vacation purposes. Many had been spending the time loafing around their city flats, attending movies, and, as happened in some cases, actually working at extra jobs. Since he established the camp, this problem has largely disappeared.

Company vacation camps are still something of a curiosity, however, and the concerns that have established them are few. For the most part, this development in personnel work has been among employers of women. Men seem able to look

(*Continued on page 38*)



The Mess Hall at May-ga-lan-ka, R. H. Macy & Company's camp for men employees, near Bear Mountain, N. Y.



The Armour vacationists live in this white domicile, set among the oaks facing the lake.



The sandy beach at Armour & Company's Round Lake, near Chicago.

Digitized by Google

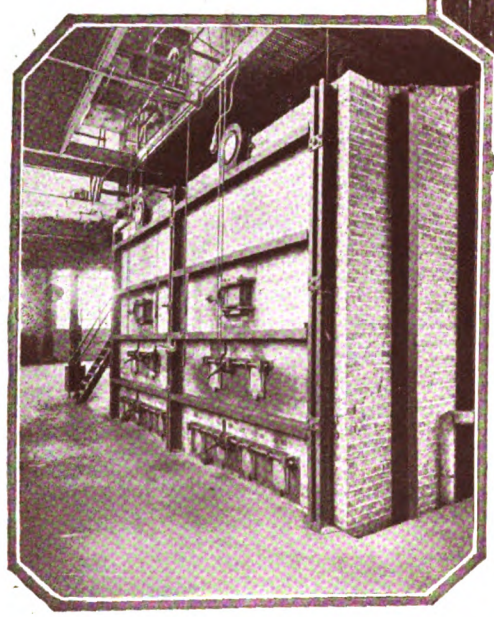
The Latest Answer to High Fuel Costs

The Present Status and Future Possibilities of Pulverized Coal Burning

By James T. Beard, 2nd

Important savings in labor and fuel have been possible in power plants by the installation of pulverized coal-burning equipment, such as shown below. Increased convenience and cleanliness, easy regulation of the fires, improved working conditions and the minimizing of waste are some of the advantages which are evident throughout such a plant.

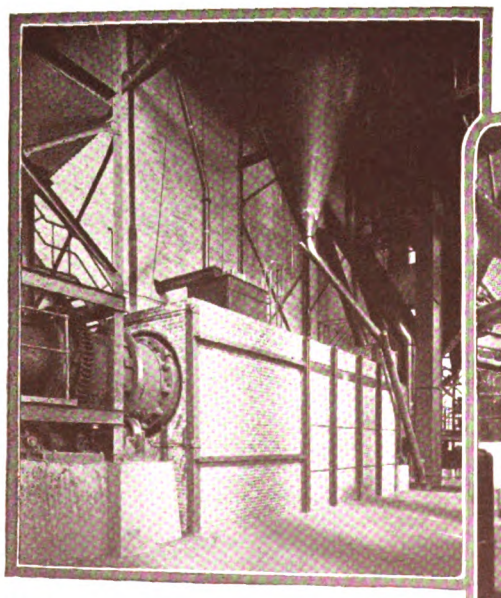




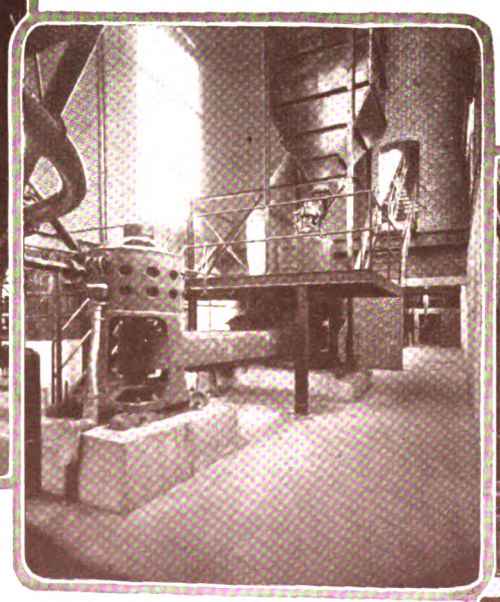
Unretouched photograph showing the kind of ash powder which is raked through the cleanout doors of a pulverized fuel-burning furnace. These fine cinders contain no clinkers, and slagless operation is secured in the use of a burner which allows a long moderate flame, permitting the ash particles to cool below their meeting point before reaching the ash pit.

The Compressed-Air Transport System consists usually of a gate, a compressed air tank with dust-tight powdered coal storage tank, a main feed line and branches. This illustration shows a blowing tank which operates under 10 to 40 pounds for blowing and has a capacity of 1,000 to 2,000 pounds of coal a minute.

SINCE the outbreak of the World War the problem of the generation and use of power in industrial plants throughout the country has assumed a position of importance, which has never fallen to its lot before, due largely to the unusual demands placed upon the power department by the needs of increased production, the increasing cost of coal and other fuel, the high wages and unreliable character of the labor available, and many other operating factors. So long as the abnormal demand for production continued, actual costs were necessarily relegated to a place of secondary importance, provided power was available when needed. With a return to normal production, however, costs again begin to demand the attention of plant executives and every effort is made to maintain them at a proper minimum by the elimination of unnecessary waste and by the adoption of more economical equipment and methods.

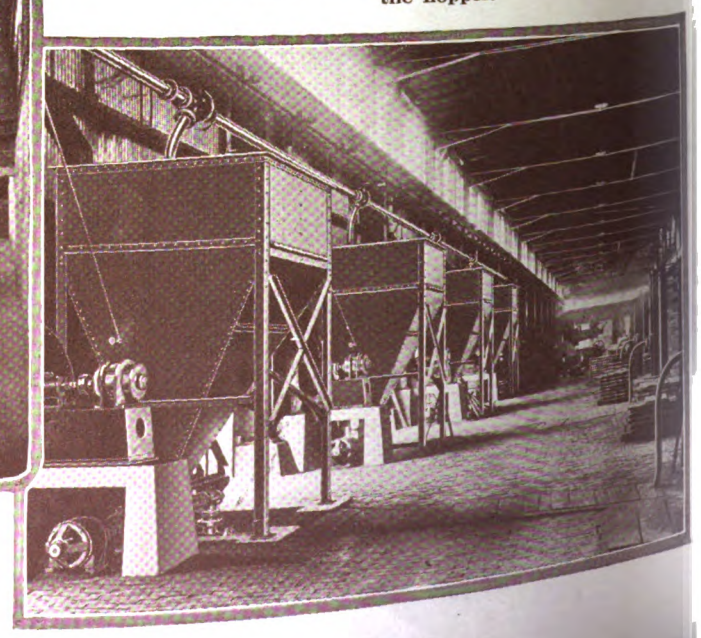


The type of fuel drier shown here may be arranged to use pulverized coal as fuel, or it may be fired by hand grates. This drier consists of an inclined cylinder, into which coal is fed at the upper end, passing to the lower end as the cylinder revolves. Hot gases pass around the sheet and dry the pulverized coal within.

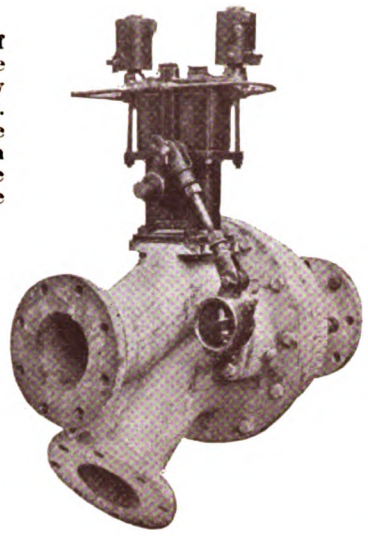


In this type of pulverizing mill, the coal is reduced to a powder by centrifugal grinding action of four large iron balls. Lump coal is fed into the mill from the bin overhead.

In this system (below) pulverized coal is delivered from a distributing or circulating pipe line to individual furnace bins, which are fitted with "high" and "low" point indicators to show the amount of fuel in the hopper.



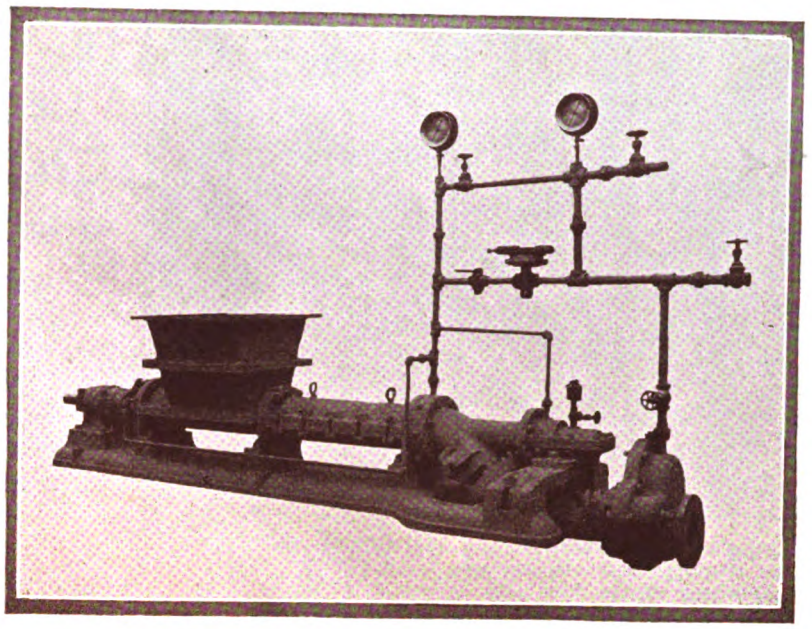
Digitized by Google



One type of distributing valve is of the disc multiple port discharge type and is electro-pneumatically controlled from a convenient point. The possitive action of the valve prevents flow past the ports which are in close circuit, at the same time allowing unobstructed passage through the open main.

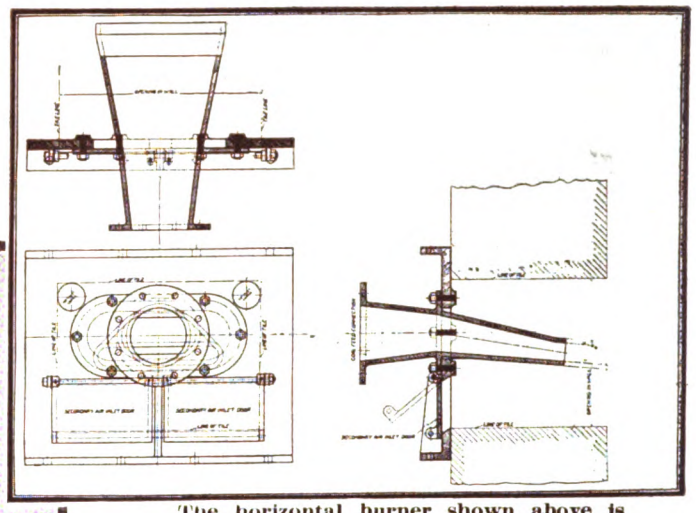
The generation of steam for power, heating and process work has been no exception to this rule. Consequently, the history of the past few years has been one of improvement in existing power plants and of the introduction and installation of particularly efficient equipment in new plants. Not the least in importance in this phase of improvement in the field of power has been the stride taken in the development of pulverized coal-burning equipment, not only for use in heating furnaces and the like, but also for use in boiler installation for the generation of steam.

One of the outstanding installations of this nature is the River Rouge plant of the Ford Motor Company, fully described in recent issues of INDUSTRY ILLUSTRATED. Many other plants have been equipped for utilizing this class of fuel and the success that has attended these installations commends them to the careful consideration of managers and executives, because of the unusual economy of operation, elimination of smoke, ease of handling fires and ashes during peak loads, low draft requirements, small stacks and general plant cleanliness.

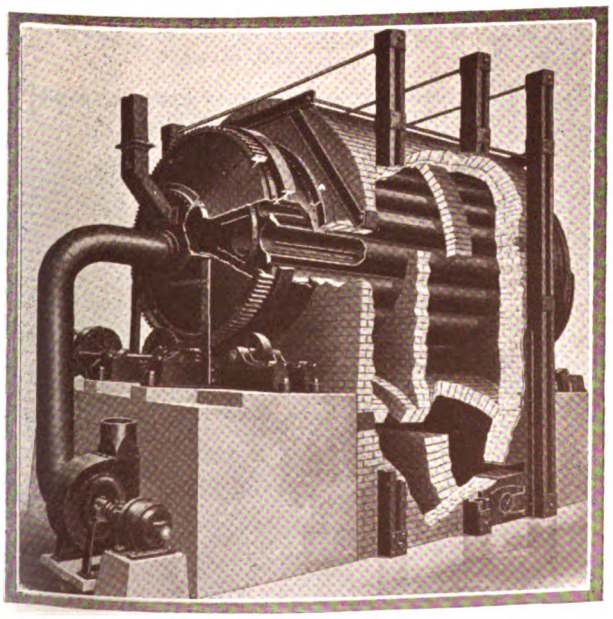


This pump consists of a 6-inch worm which is capable of handling upwards of 20 to 50 tons of pulverized coal an hour. The mass of fine coal is started in motion by the screw which revolves in a closed barrel. Air is supplied for carrying the dust to the points of consumption at from 15 to 45 pounds pressure, depending on the length of the pipe line.

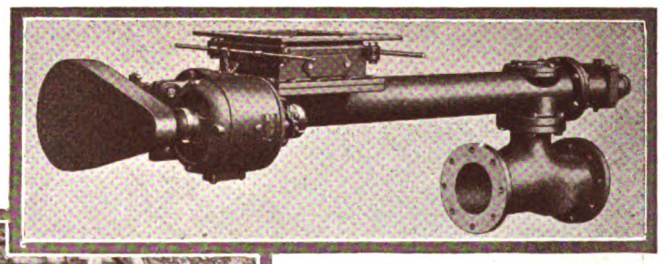
Vertical type burners (below) are adapted to boiler furnaces, providing plant design permits. These burners are used in multiple according to the size of the furnace and the capacity which the boiler must develop. Due to the preheating action of the reverse flow of gases on the steam of fuel from a vertical burner, it is suited to the burning of low-volatile coals.

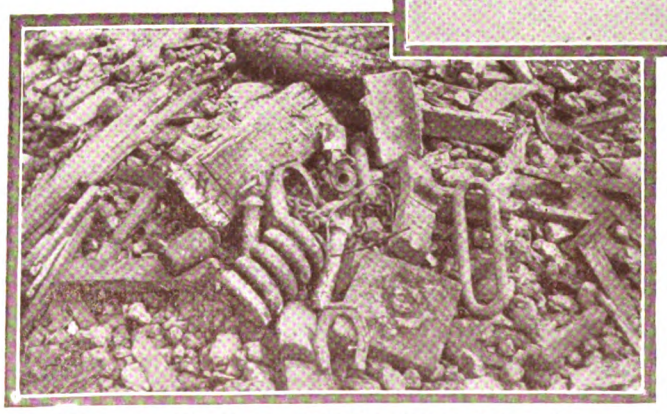


The horizontal burner shown above is generally used on rotary kiln furnaces. The mixing chamber may be attached to the discharge end of the feeder or it may be connected to the flange of the burner. Air inlet doors are provided to permit infiltration of secondary air for complete combustion. It is impossible to burn low-volatile coal successfully with a horizontal burner of this type.



Crushed coal is fed into the tubes of this rotary drier, which is inclined to feed the pulverized dust slowly toward the discharge end. Heated gases pass around and through the tubes to dry the coal, circulated by the draft of an exhaust fan.

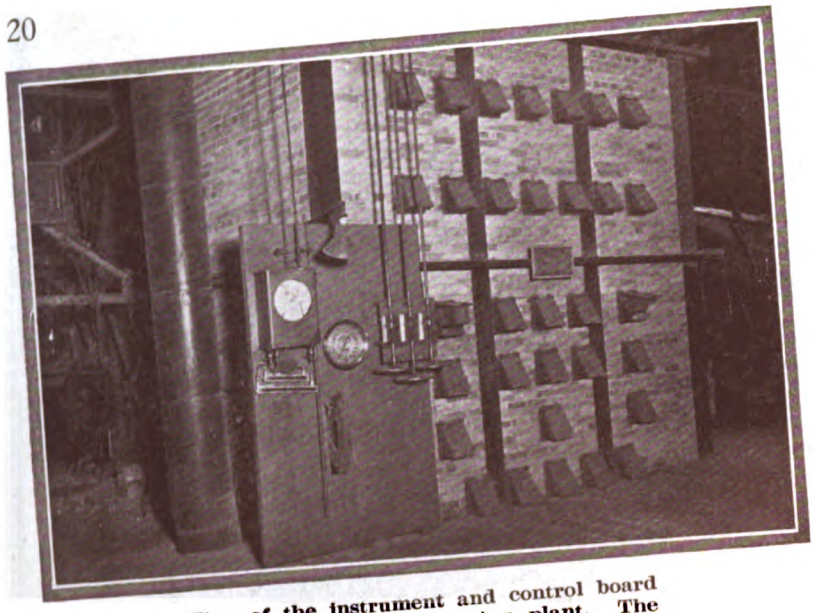




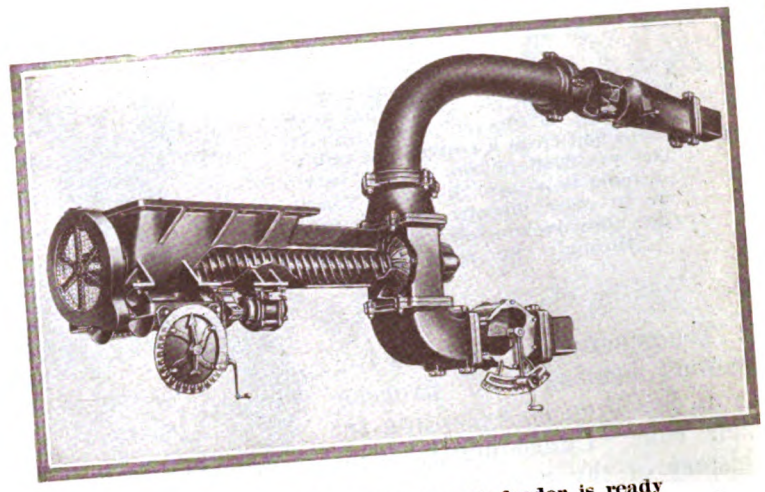
Pulverized coal is delivered from the screw feeder to a mixing chamber, often located at its discharge end, where it is mixed with air from a low pressure blower, becoming intimately mixed and thoroughly separated before combustion in the furnace burner.

The necessity for a suitable means for removing foreign material from coal is emphasized by this picture of a few odds and ends that come in the usual car of coal. Usually this is accomplished by a magnetic pulley or other device which attracts and holds iron and steel bolts or bars, such as are seen here.

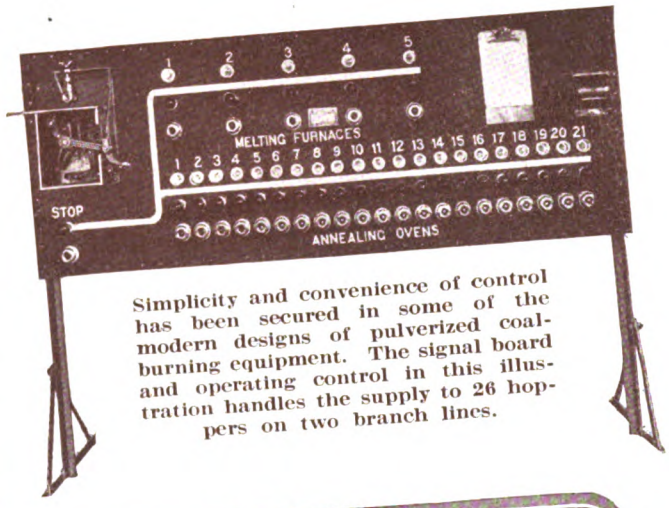
Digitized by Google



View of the instrument and control board in a pulverized coal-burning plant. The condition of the fires and capacity of the boilers are at once visible and adjustment can quickly be made which will influence the combustion and increase the boiler's rating.



This type of powdered coal feeder is ready for operation with the exception of the storage hopper and air supply. Power is supplied by an electric motor driving through a reduction gear set and variable speed transmission. Coal supply can be regulated in fractions of an ounce per minute.

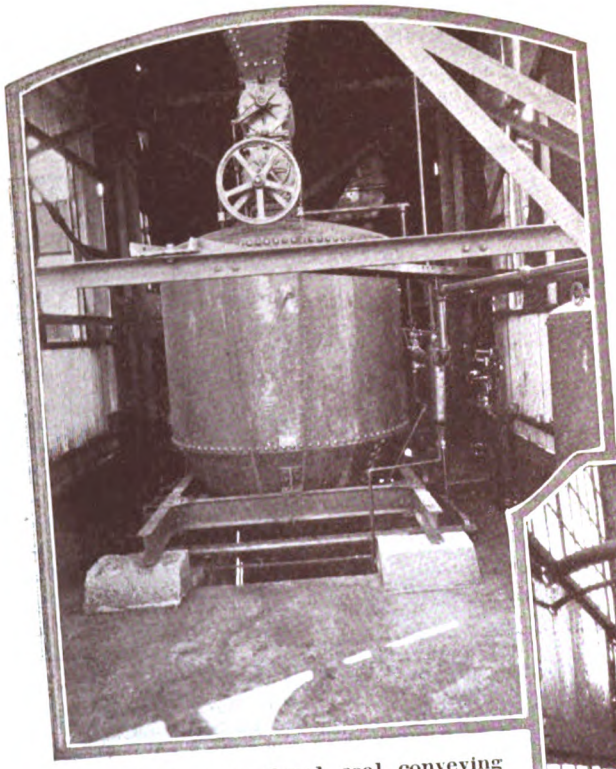


Simplicity and convenience of control has been secured in some of the modern designs of pulverized coal-burning equipment. The signal board and operating control in this illustration handles the supply to 26 hoppers on two branch lines.

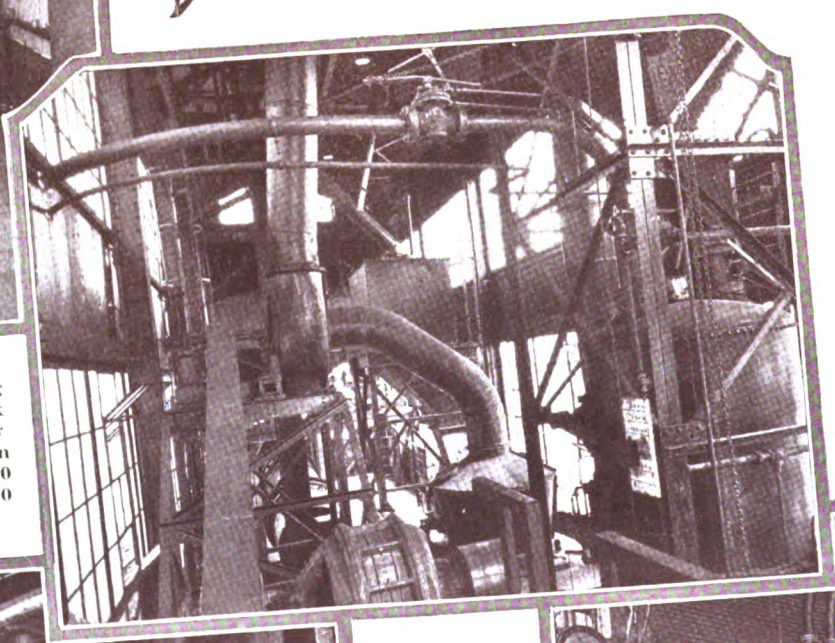
The principle underlying the burning of powdered coal is simple. To burn an ordinary lump of coal completely it must be surrounded by sufficient air for combustion and must be heated to the proper temperature. Since the air necessary for burning cannot reach the core of the coal until the outer surface has been burned away, it is evident that the speed of burning must necessarily be somewhat retarded.

When coal is pulverized, however, each infinitely small particle of the fuel is sur-

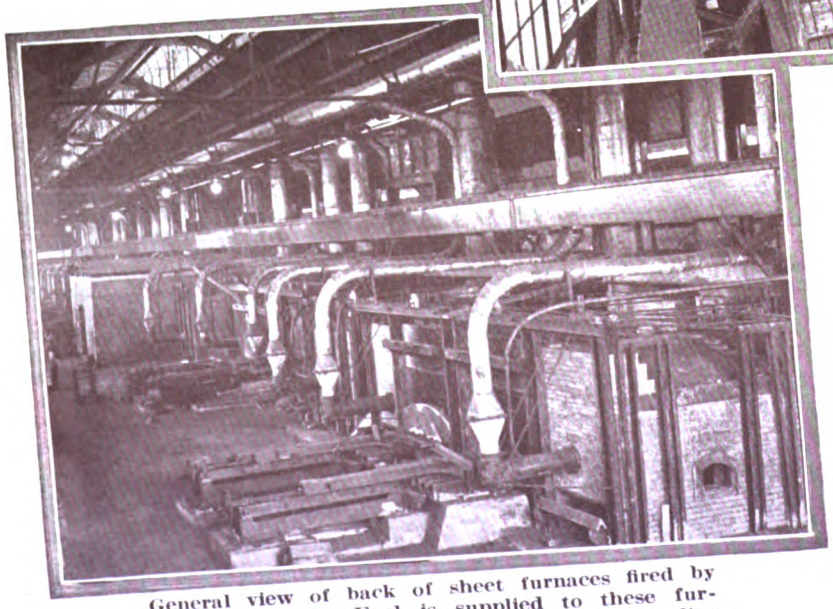
(*Continued on page 68*)



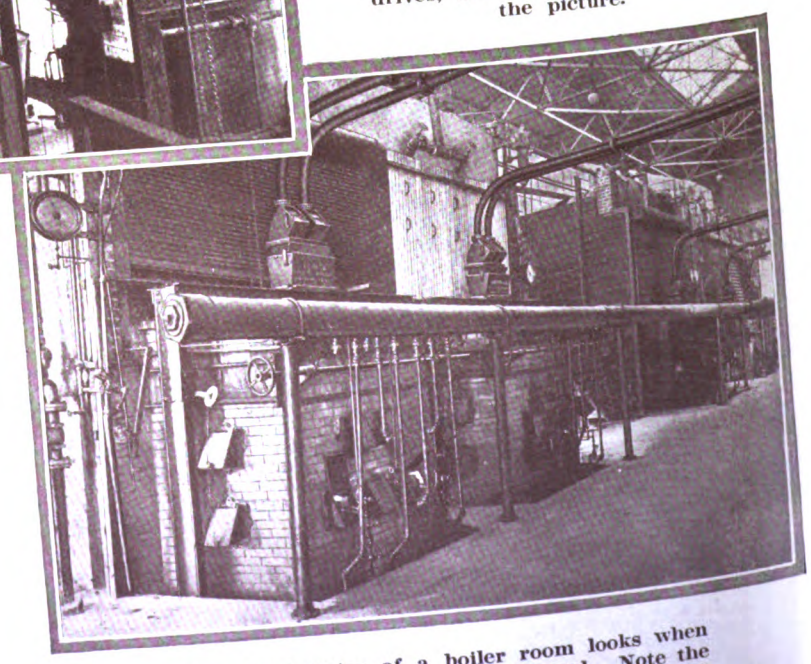
Part of a powdered coal conveying system, showing valve operating mechanism and weighing tank mounted upon a scale. The capacity of this system is 20 tons of coal an hour, delivering powdered coal to 40 hoppers through a conveyor line 1,300 feet long.



At the left—Interior view of a large pulverizing plant, showing the top of the blow tank and the full distribution line in the foreground at the top. The chain at the right runs over sheaves to operate the valve. The amount of fuel in the bin over the blow tank is shown by the indicator board, also at the right. Pulverizer and exhaust fans, with their motor drives, are seen in the center of the picture.



General view of back of sheet furnaces fired by pulverized coal. Fuel is supplied to these furnaces from bins through the small pipe line branches which are seen (marked in white) directly under the much larger pipes which supply the air required.



How the interior of a boiler room looks when equipped for burning pulverized coal. Note the cleanliness of the installation. Piping is located well overhead and the system is characterized by its ease and convenience of control.

Digitized by Google

Shooting Big Game, Pictures, and Cement

By Ernest H. Rowe



Carl Ethan Akeley—Supergunman, Sculptor, Inventor.

THE life stories of some men resemble a railroad track. They travel fairly straight from a starting point to a destination. Everything important they do moves on that track. But here is a man whose accomplishments are better represented by a tree. There is a trunk, a major interest rooted deep in the soil of early life, growing unswervingly upward. But also there are branches which, while they spring from it, spring away from it, grow off in different directions, bearing various fruits. His business card for forty years has read, "Carl E. Akeley, Taxidermist." At least he had some printed that way when he was a sixteen-year-old boy, and he could use them still. But how completely he has revolutionized the connotation of the word! When the upholsterer around the corner got enough work stuffing deceased Fidos and poll parrots or canary birds, he scrawled a cardboard sign, "Taxidermist," for his window—and he had a perfect right to the title. Upon Carl Akeley, in 1916, membership in the National Institute of Social Sciences of New York was conferred "for making taxidermy one of the arts." For *making* it, notice. And an *art*—notice that.

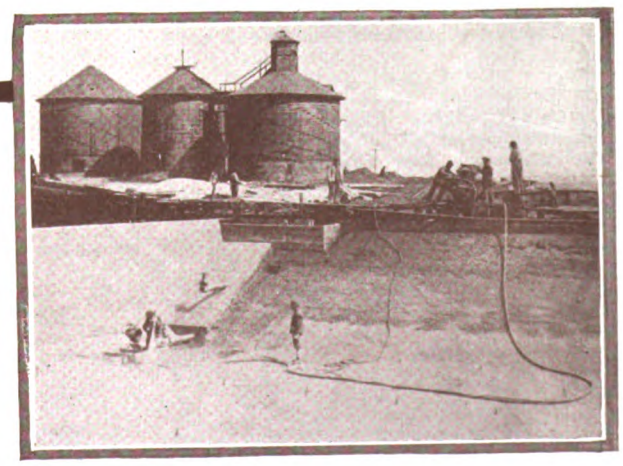
(*Continued on page 51*)



The "cement gun" was developed to some extent from the machine Mr. Akeley had made for his own use in coating with cement or plaster of paris the animal manikins on which skins were mounted for the Field Museum



Side view of the Akeley camera. It looks different, and it is different. With the one control "stick" it is moved smoothly in every direction so as to follow the movements of wild animals and birds.



Heavy work. Building a great reservoir of "gunite" at the Anaconda copper mine, Great Falls, Mont.

Digitized by Google

Moving Mountains Without the Shovel Gang

Handling Bulk Materials at Half the Cost

By Matthew W. Potts

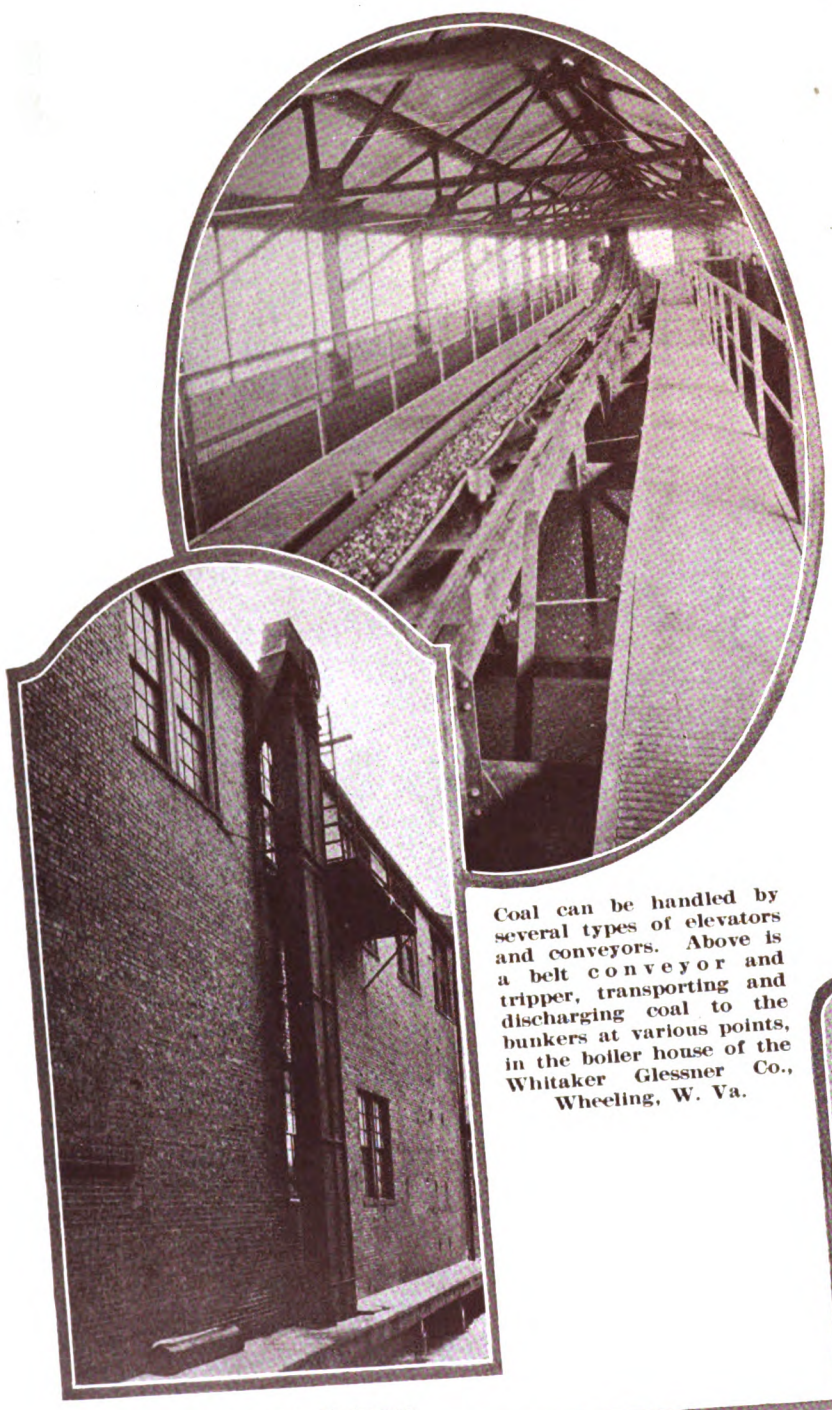
THE handling of bulk materials was the deciding factor in the development and use of elevating and conveying equipment. It has been found, in practically every industry, that the wheelbarrow and dump-wagon are inefficient when large quantities of materials have to be handled over a given route.

When such a condition exists it is generally possible to install some type of elevator or conveyor to handle the material. This equipment has many advantages over the old hand methods, foremost of which are reduced cost and high speed and dependability. For illustration we will take the experience of a brick manufacturer at Dayton, Ohio, whose general manager says:

"The operating cost of this conveying equipment is 54 per cent. less than our former costs; it displaces six men and saves a total of $3902.14 a year in wages alone. Though used only 3 or 4 hours a day, they average 150 tons of material a day. The machines have also reduced our labor troubles, which were unusually serious because of the disagreeable nature of the work.

"We are manufacturers of sand-lime brick and roofing tile. About three years ago we installed the loader and conveyor shown. Since the installation was completed we have never had to shut down our plant for lack of materials, though such shortages formerly caused expensive tie-ups.

"The operation is very simple. First the material is dug out of the bank by the loader and discharged onto the portable conveyor. This discharges onto the long conveyor which carries the material directly into a storage bin inside which holds 125 tons. This conveyor is adjustable in length from 250 to 350 feet.



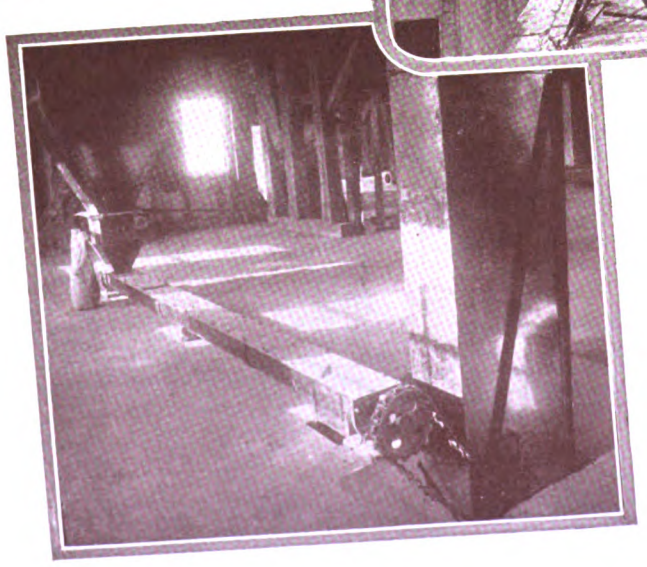
Coal can be handled by several types of elevators and conveyors. Above is a belt conveyor and tripper, transporting and discharging coal to the bunkers at various points, in the boiler house of the Whitaker Glessner Co., Wheeling, W. Va.



Another use for bucket elevators is in the raising of grain from the hold of the ship to the grain elevator. This installation was made and is operating at the Dock Board Public Grain Elevator in New Orleans. These elevators handle hundreds of tons of grain per hour.

While coal can be handled with a belt conveyor, it is also economical to use a flight conveyor. In this equipment a tripper is not necessary as the material is conveyed in the trough and discharged through gates, or openings in the bottom of same.

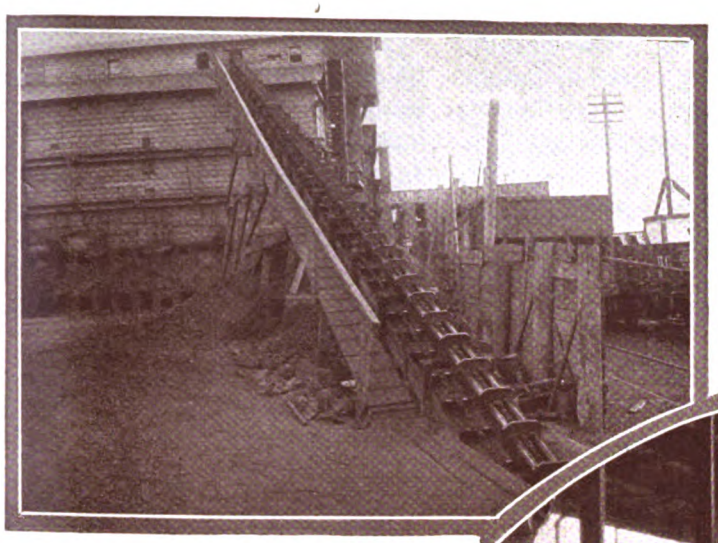
The centrifugal discharge bucket elevator will elevate materials for heights of more than one hundred feet. This one in the plant of the Van Camp Packing Co., Louisville, Ky., is handling coarse salt used in making soap. The salt is shoveled direct from the car to the boot hopper opening in the platform; the elevator buckets carry the material over the head sprocket and discharge their contents into the spout passing into the building.



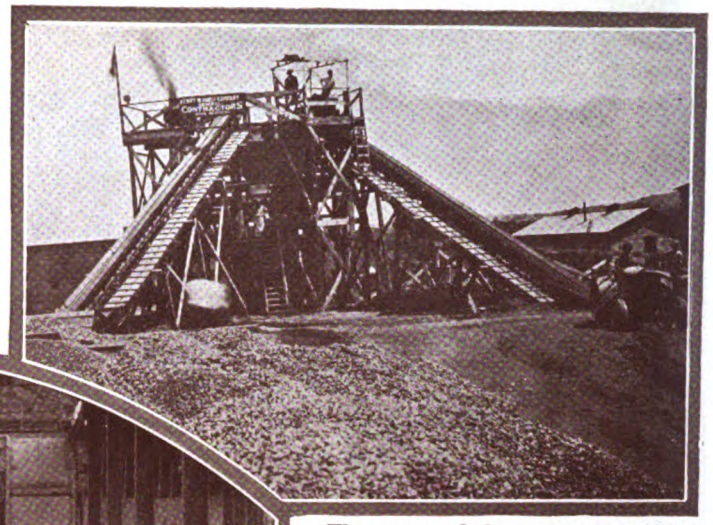


Another piece of equipment that will easily handle bulk materials is the screw conveyor. Building construction often necessitates the use of a conveyor as shown. Here, we are conveying lime from the storage hopper to a bucket elevator.

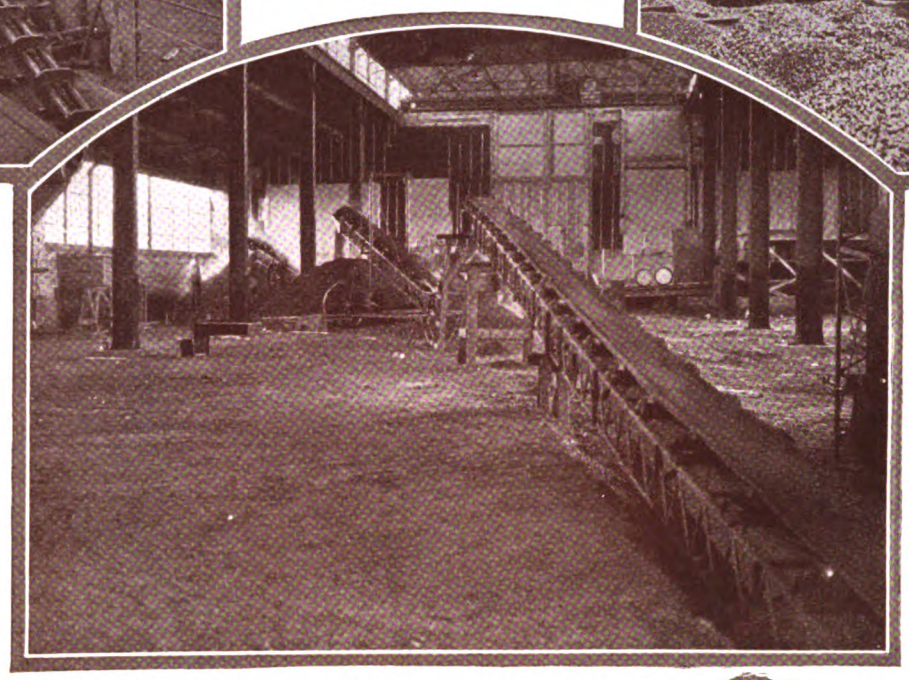
Digitized by Google



While conveyors are not recommended as elevators, they are often used as such. This flight conveyor is elevating coal from a track hopper to a conveyor which distributes it to the proper bunker.



These two belt conveyors, above, are each 72 feet long and are handling sand and gravel. Previous to their installation a stiff leg crane was used. The conveyors have proved more efficient. The tractor pulls a drag line to get materials from storage piles when trucks don't arrive regularly.



It is seldom that a manufacturer uses his own equipment. This shows a conveyor manufacturer doing what he has often recommended others to do. The conveyors shown above are handling cinders for making a fill in a newly constructed building.

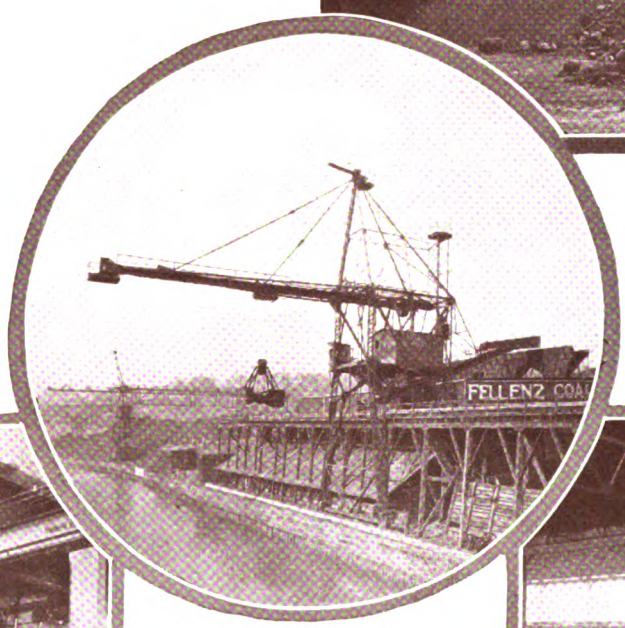


Below—Small commercial coal dealers are the foremost users of this class of equipment. In this case the flight conveyor is used both as an elevator and a conveyor.

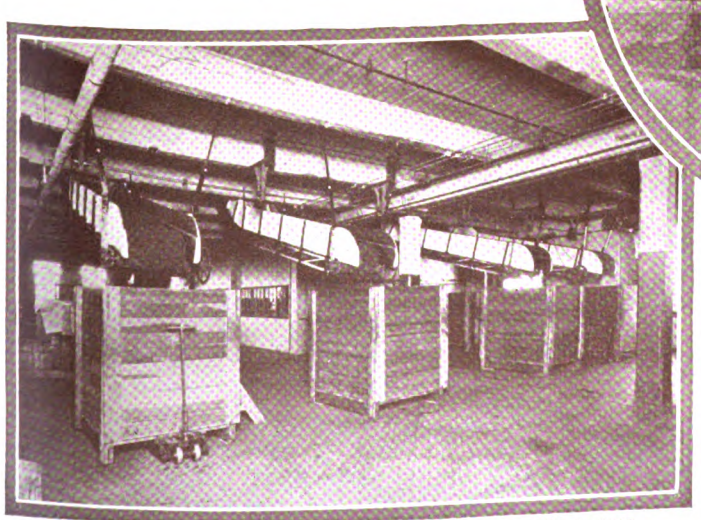
"The cost of operating the machines is very reasonable. We estimate their life at ten years. Repairs and maintenance have been so very low that $100.00 a year on the loader and $50.00 on the conveyor are ample."

Many other installations have been made with the same results. Looking at the many illustrations shown on these pages it can readily be seen that this type of equipment is doing what it would be impossible to do with man labor. Also note the diverse materials handled and the various industries in which this equipment has been installed.

Take the raising of grain from the hold of the ship into the storage elevator. How would a gang of men go about this task and how long would it take to unload the ship? It is necessary for these ships to be kept plying between ports and fully loaded if they are to make money for their owners. This necessitates quick unload-



Bulk materials are received in ships, cars and trucks. The use of material handling equipment permits quick unloading of all three. The 3-ton bucket and belt conveyor shown at the left will handle approximately 360 tons per hour, from ship to storage.

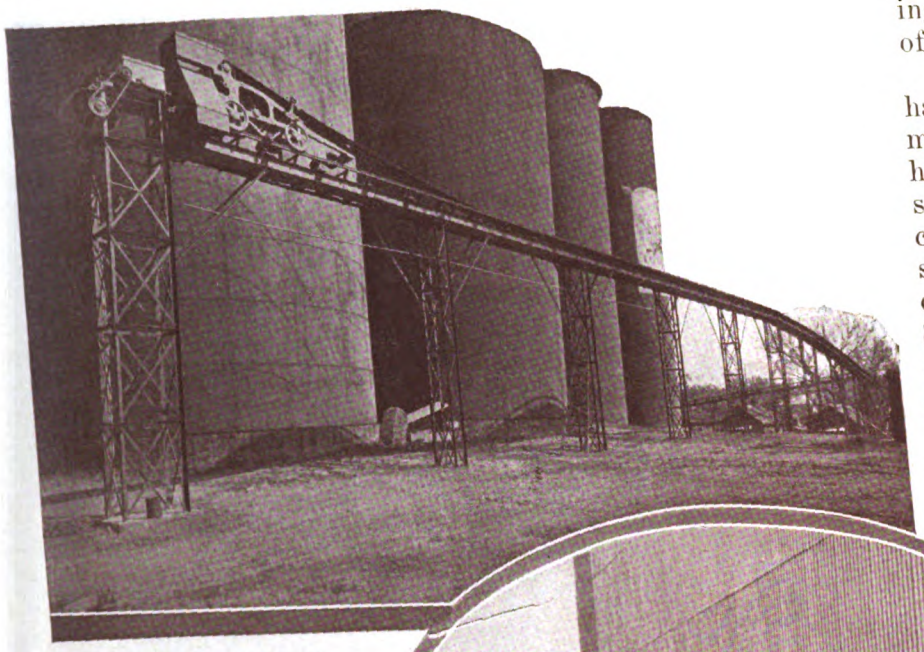


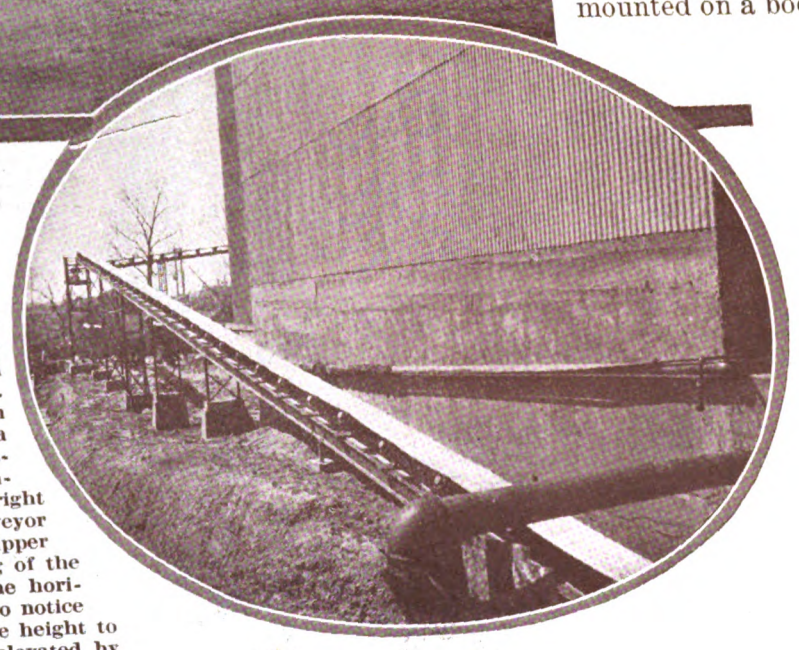
The short conveyors suspended from the ceiling are handling tobacco at the plant of the American Tobacco Co., Louisville, Ky. When the large boxes are filled, a man, by the use of a lift truck, transports them to another department and places an empty box into which the conveyor may discharge.



Loading gas purifier tanks with sand used to be done by a gang of men with wheelbarrows. Today two men and a portable belt conveyor accomplish the work cheaper and quicker.

Digitized by Google





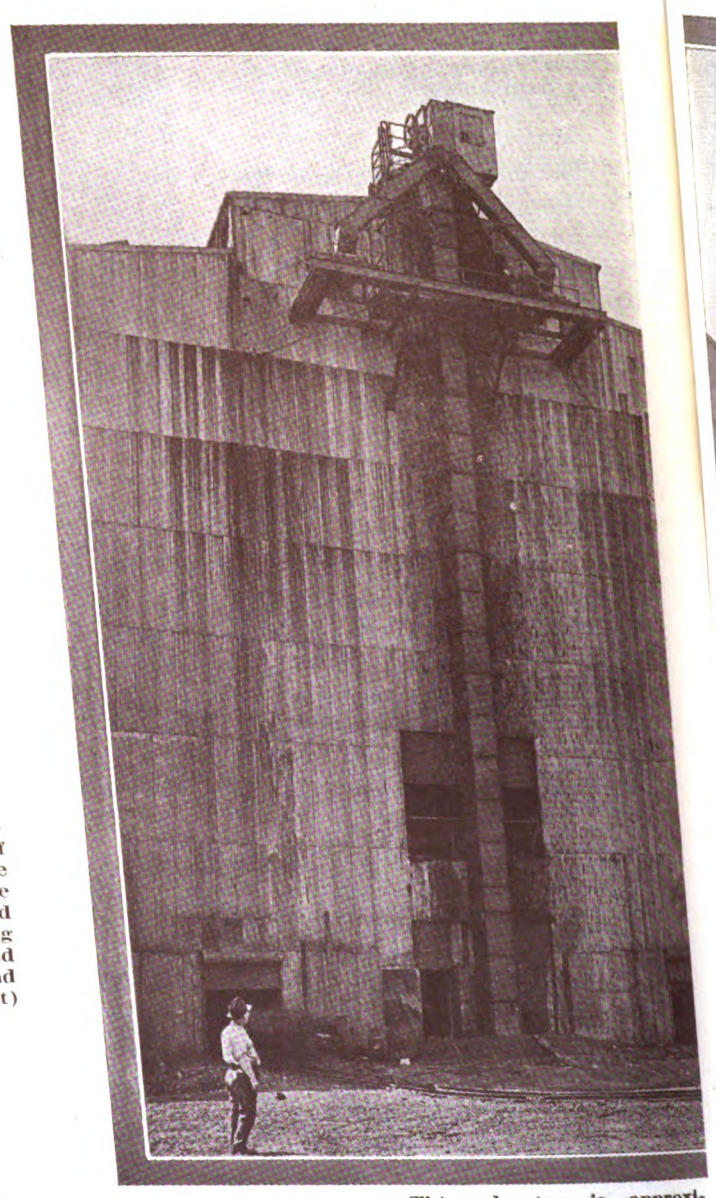
The Morten Milling Co., Dallas, Tex., use two belt conveyors and a tripper for handling their coal from cars to storage pile. The first belt travels from the track hopper to a given height where it discharges to another conveyor running at right angles. The second conveyor is equipped with a tripper which permits unloading of the belt at any point on the horizontal run. The point to notice in this installation is the height to which the material is elevated by means of conveyors, and the angle on which the conveyors operate.

ing and loading. The method of quick loading is also shown.

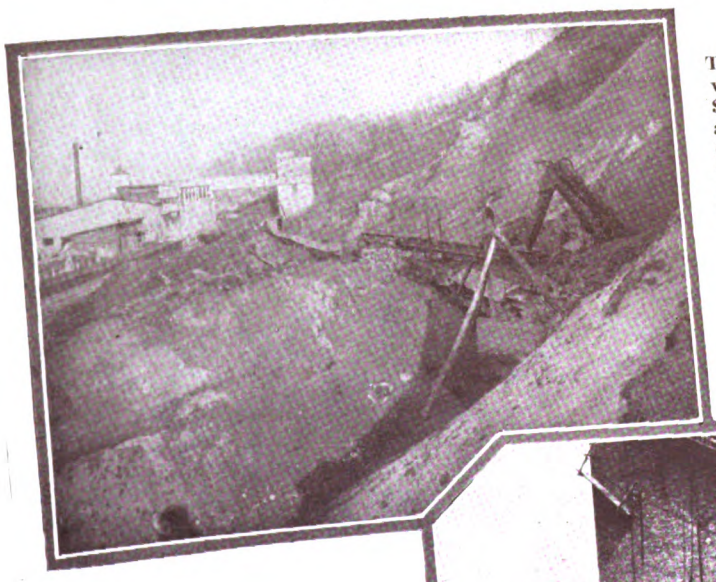
The owners of Lake Vessels have gone far in the development and use of materials handling equipment. Their season is limited and they do not care to spend much of the open season tied up at a dock while cargos are being unloaded. Some of these vessels that operate on the same type of cargo the full season have been equipped with conveyors in the hold and a conveyor mounted on a boom for unloading direct to the storage pile. These are great time and money savers.

Coal dealers are also finding the use of handling equipment a great help at the unloading end as well as the loading end. Today very few commercial coal dealers unload their cars or load their trucks by hand, it is generally done with some form of elevator conveyor.

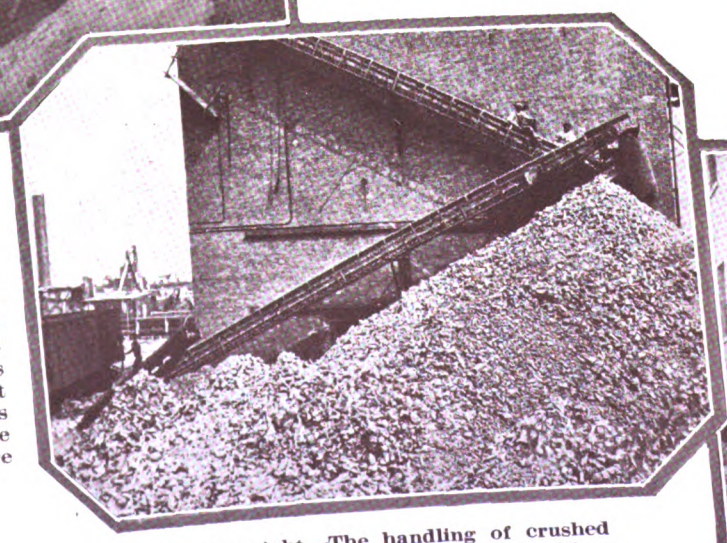
Gas plants and coke ovens are another field for this equipment, and chemical works



This elevator is approxi- is equipped with a bifurcated either one of two belt con- material lengthwise



This installation of belt conveyors made a saving of $3902.14 a year in wages alone and permitted the plant of the Crome Brick Co., to be operated without danger of running short of raw material as had been the case when hand methods were used. (See text)



With this installation of cleated belt conveyors, the General Carbonic Co., Long Island City, N. Y. is handling approximately 20 tons of coke per hour at a cost of $.4258 per ton. Previous to the installing of the equipment their costs were $.8438 per ton.



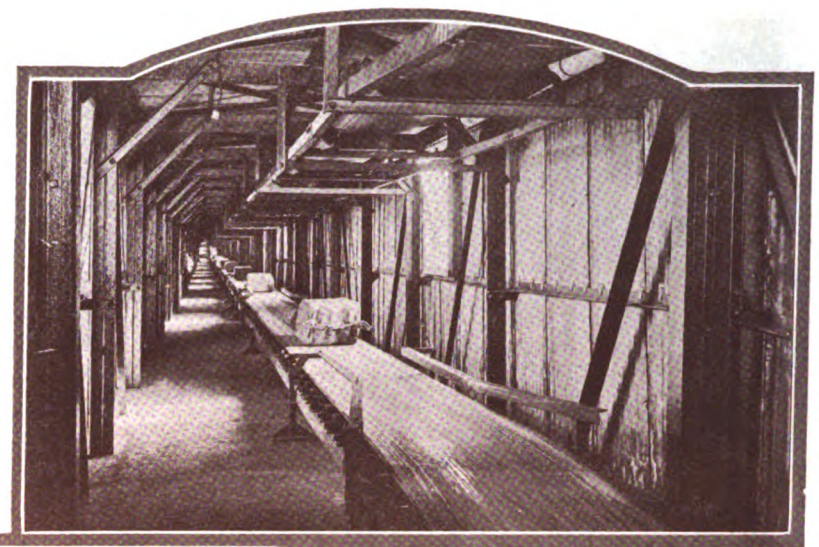
At the right—The handling of crushed ice has to be taken care of quickly. Here the ice crusher is located in the basement and feeds to more than one elevator for distribution to various points in the plant.

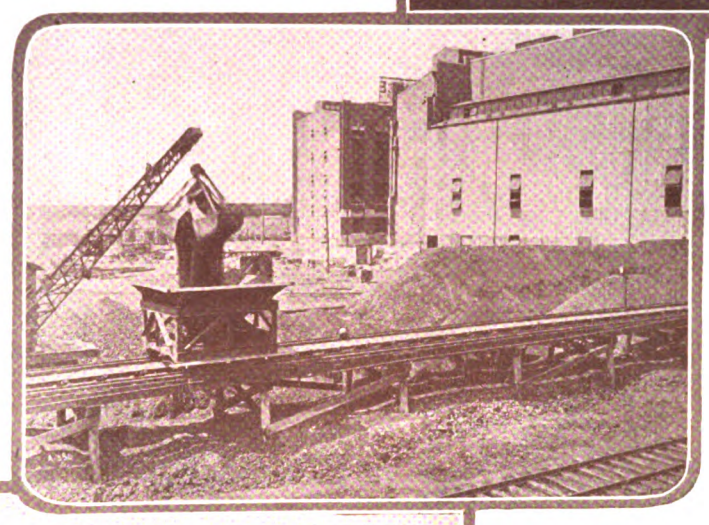
Digitized by Google

would be useless if they did not have the various types of elevators and conveyors for handling their bulk products, such as salts, crushed ice, clay, lime, sand, etc., that are used in such great quantities that it would be physically impossible to handle it with the old hand methods.

Looking at the coal storage installation of the Erie Railroad at Croxton, N. J., will give a good idea of the work that could by accomplished by one line of belt conveyor. Can you imagine how many men and how long it would take to place the amount of coal in storage that is shown in these two illustrations, and then how long it would take to reclaim it from the storage pile? The man handling of such a mess of bulk material would have been possible in the days of the Pharaohs, when slaves were in vogue, but in the present day, even if the labor was available, the cost would be prohibitive.

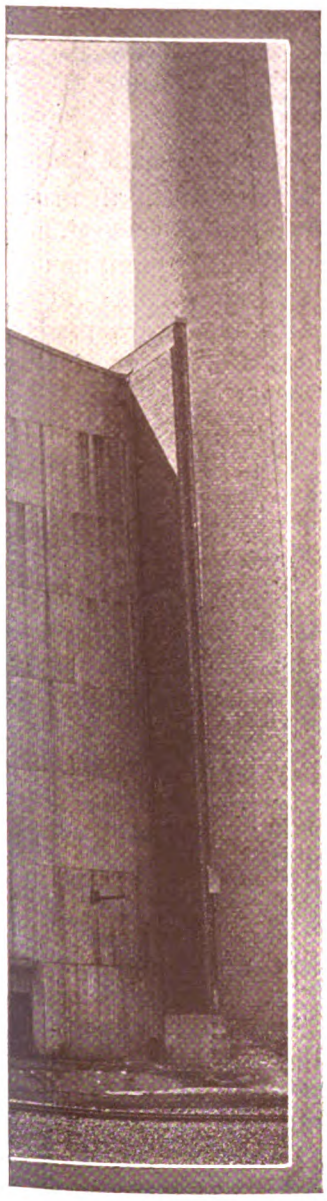
Every day new uses are added to the many old uses of



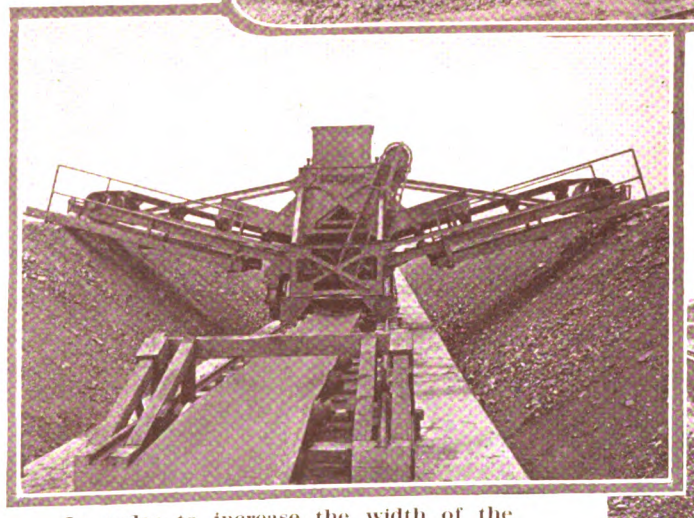


It is seldom that both runs of the same conveyor are made to carry materials. The conveyor shown is in operation at the Edgewater, N. J. plant of the Midland Linseed Co. The upper run of the belt is troughed and carries bulk linseed from the ships to the storage hoppers. The lower run of the belt is flat and well supported by flat idlers, and on this, linseed cake in bags is transported to the dock and ships.

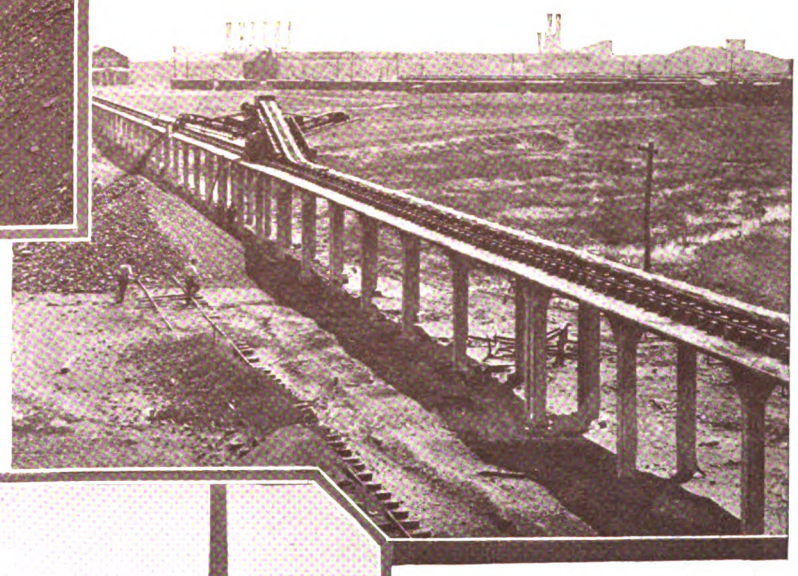
Loading a belt conveyor at various points is sometimes considered a difficult problem. A traveling hopper as shown is quite effective and makes loading easy when a locomotive crane is used for recovering materials from outside storage.

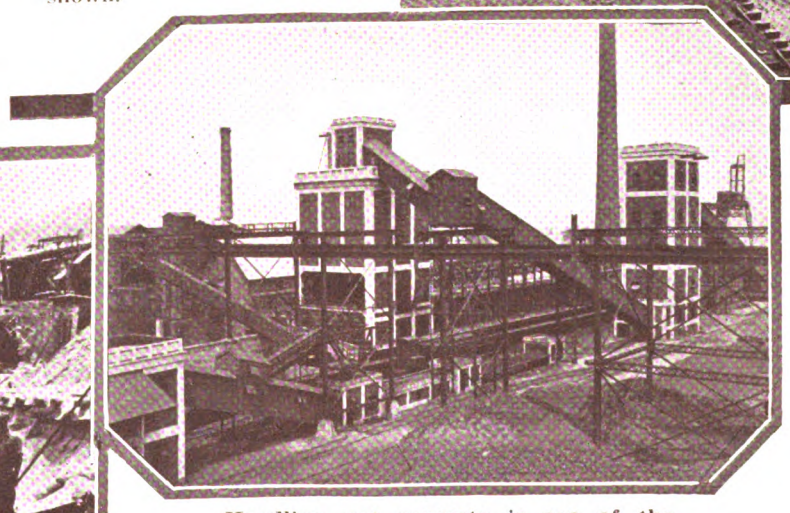


mately 90 foot centers and spout that discharges to veyors that transport the of the building.

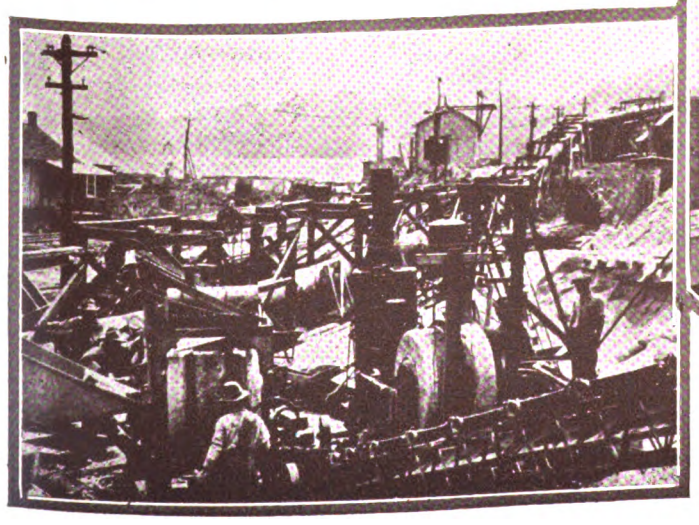


In order to increase the width of the storage pile at the Erie R. R. locomotive coaling station, Croxton, N. J., this "Airplane" tripper was used for unloading the belt conveyor. The two short belts on the wings, and the tripper itself are operated by power transmitted through the load carrying belt. The start of the pile and the length of the run is clearly shown.



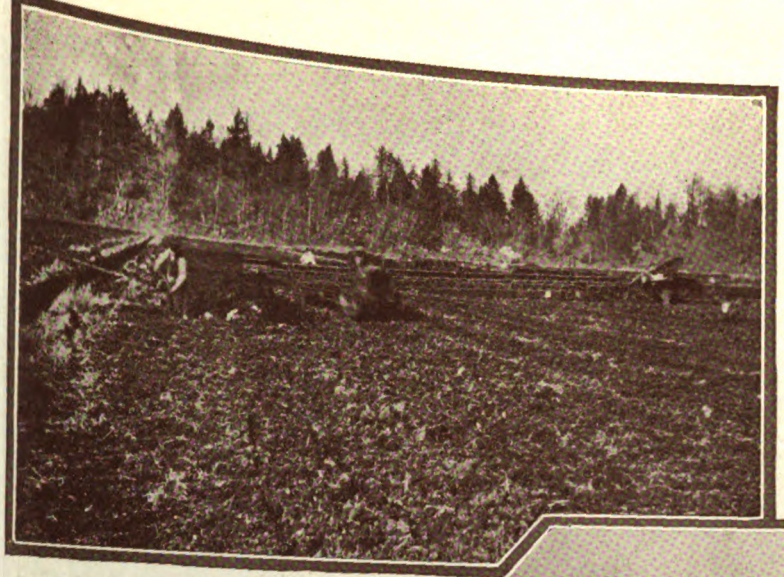


All belt conveyors should be placed in a housing if possible The method of housing is shown in the photograph. Note how the conveyors are used to transport materials between buildings.

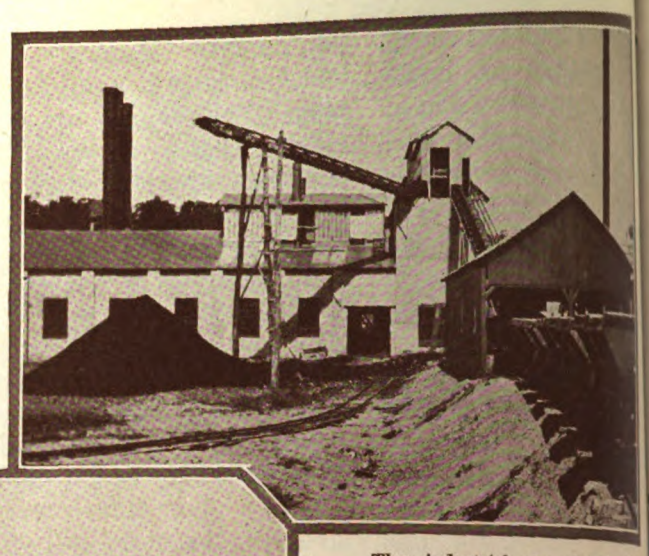


Handling wet concrete is one of the many difficult things done by means of material handling equipment. This belt conveyor will easily handle the full capacity of both concrete mixers shown in the foreground.

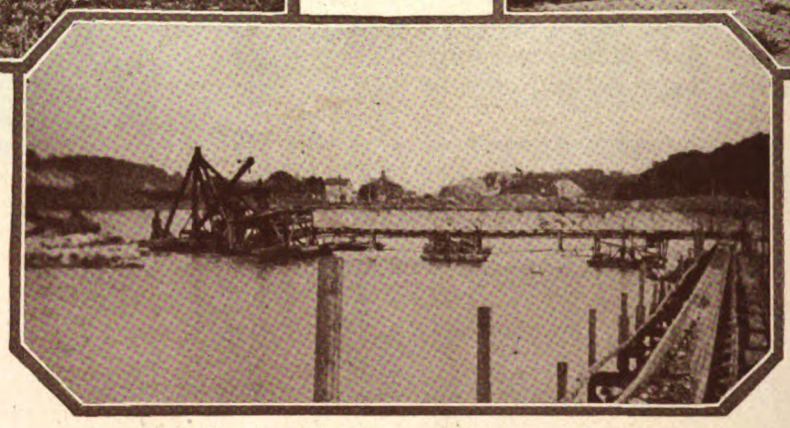
Digitized by Google



In Ireland, peat is gathered by man and mule. In this country, conveyors are used to better advantage. After the peat is plowed up it is shoveled directly onto the long belt conveyor which loads it into the industrial cars.



The industrial cars of peat are drawn to the plant and dumped onto another belt conveyor which carries the peat into the plant or to yard storage. With this system the cost of handling is less than 5c. per ton.



Conveyors mounted on pontoons handle wet materials as easily as other conveyors handle dry materials. Here the shovel digs under water and dumps direct to a hopper that feeds the material to the belt.

elevators and conveyors. It was long thought that the only way to handle wet concrete was by means of concrete buggies, but here we have an illustration of an actual installation, where one belt conveyor will easily handle the capacity of two concrete mixers, and at the same time transport the load on an incline.

Other illustrations show how contractors and others are using the conveyors for handling wet materials, and now after many years of experiment, a belt has been made that will carry hot materials.

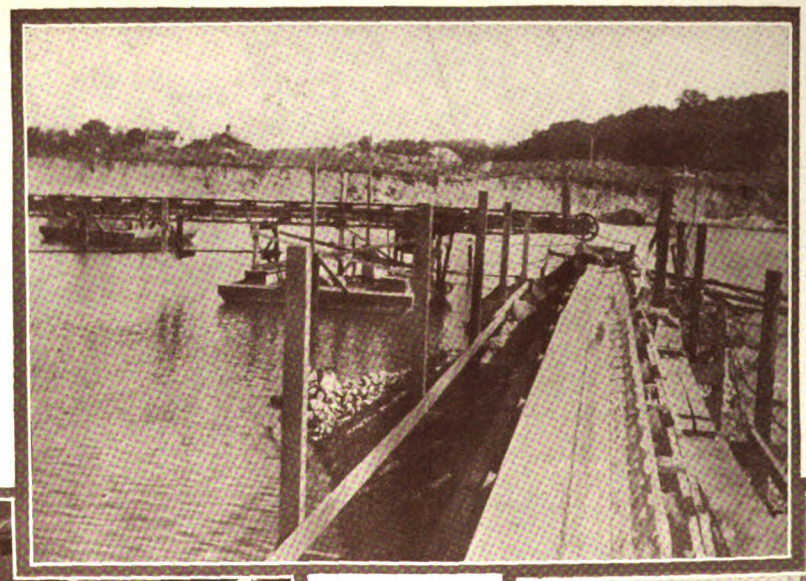
Judge Gary, in a recent interview, made a plea to allow more immigrants to enter the country, as a serious shortage of manual labor already existed. Think how many men could be released for more productive labor if elevators and conveyors were permitted to handle *all* bulk materials, and in addition to the releasing of these hundreds of thousands of men, there would be a saving of millions of dollars each year.

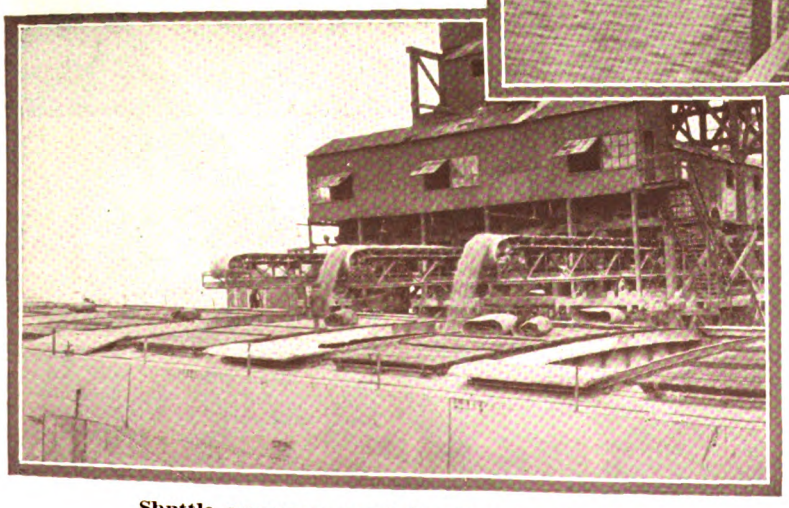
It was during the high production period of the war that materials handling equipment made its biggest strides; and more installations were made during these few years, than had ever been made over all the years previous. In fact, the demand for this equipment was so great that the manufacturers had to enlarge their plants in order to fill their orders.

The time to make improvements in the production plant is not when production is at a peak, but the improvement should be made prior to this peak load. For this reason, plant managers and production managers should right now be giving serious thought to their handling problems.

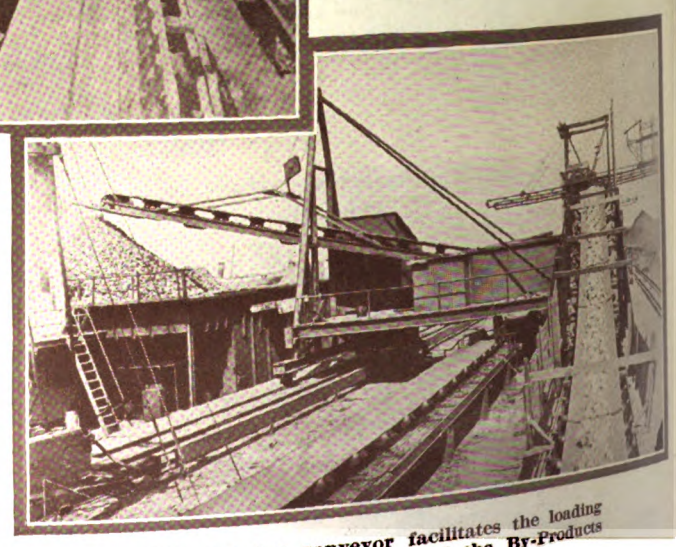
The labor situation makes it imperative to take steps immediately to prevent a serious curtailment of production. The present shortage can only grow more acute.

This view, below, shows more clearly the way the conveyors are mounted on the pontoons and how one conveyor discharges to the other at the same time changing the direction of travel.





Shuttle conveyors are belt conveyors mounted upon traveling frames, which permits their being moved backward and forward in a given line of travel. These three shuttle conveyors trim the load without the use of man labor.



This moving conveyor facilitates the loading of barges at the plant of the By-Products Coke Co., South Chicago.

Digitized by Google

How to Eliminate Glare and Yet Enjoy Benefits of Needed Daylight Illumination

By T. T. HOLT, President of The Skybryte Co.

FOR years our organization has been working to perfect product that would eliminate lare from factory windows and kylights and reduce the temerature of daylighted interiors.

The need of such a product vas only too apparent. The rice that industry was paying ach year because of glare was ppalling. We found by reearch work that one of the ain causes of fatigue was the iring of the optic nerve. Too close work of course, causes this but far too often it was caused by glare. This tiring of the optic nerve by glare sapped the strength of the workmen. It made them listless, sleepy and careless. And this of course, resulted in lessened production, more spoilage and an increase in accidents.

After we realized the need for a product to eliminate this glare we made a research among industrial plants to find out just what qualities were needed in this product to make it adaptable for industrial use.

This research showed that it would have to be a product that while diffusing the light and eliminating the glare would not appreciably reduce the lighting. It also had to be a product that would not rub off or flake off; one that would not be washed off by rain when applied to the outside of glass, and yet one that could be easily removed by warm water when desired. Then, of course, it had to be easy to apply and economical.

We finally perfected a product that came up to these specifications — we call it SKYCO No-Glare.

The product is slightly blu-ish in appearance. It diffuses the direct rays of the sun, absorbs much of the heat rays and modifies daylight to an ideal, cool, restful color. It transmits the kind of perfect lighting that has been striven for for years by much more expensive means.

The cost of SKYCO No-Glare is so trifling and its results so satisfactory that we are anxious to have every industrial plant in the country know about it thru actual experience. We are glad, therefore, to send a one pint sample (enough to cover about 80 sq. ft. of glass area) with our compliments, to any manufacturer. Just ask for free sample of SKYCO No-Glare. Address The Skybryte Co., Bangor Bldg., Cleveland, Ohio.

Skybryte
CLEANER POWDER

Prepared especially for plain and polished glass. No water necessary. Cleans without scratching. Positively no muss or dust.

SKYCO
Sash Paint

An unusually high-grade sash paint. Penetrates quickly and lasts far longer than any other similar paint we know of. It costs more per gallon but less per job.



Before cleaning glass with Skybryte and with no electric lights burning there was only 7/10 feet candle illumination.



Before cleaning glass with Skybryte but with three 100 Watt Type "C" lamps burning illumination amounted to only 2 1-2 ft. candles.

These Same Results in Your Plant, too

DOES proper daylight illumination really increase production? Does it lessen accidents and spoilage? Does it actually pay in dollars and cents to keep glass clean? Is it easy and economical to do so with—

Skybryte
CLEANER (LIQUID)

The pictures in this message are your answer. They are unretouched photographs taken at the Ferro Machine and Foundry Co. of Cleveland. They prove the amazing difference that dirty and clean glass makes in illumination.



After cleaning glass with Skybryte and with no electric lights burning, light meter indicated 15 ft. candle illumination. This was an increase of 600%.

No Skilled Labor Necessary

An unskilled laborer dips a brush in Skybryte and coats the dirty glass. Almost instantly the hardened crust of rust, carbon scale and soot is loosened. Then he flushes off with water. The glass is clean. Daylight floods your plant.

Costs Less than ¾c per sq. ft.

Five gallons of Skybryte cleans 4000 sq. ft. of dirty glass. An unskilled laborer can clean 5000 sq. ft. per day. The average total cost of cleaning including labor and material is less than ¾c per sq. ft.

FREE! Valuable Interesting

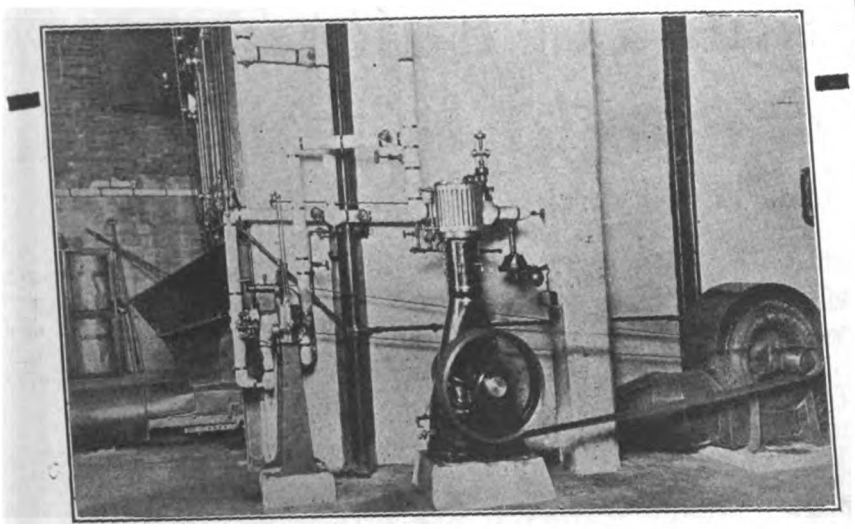
A scientific treatise on natural light written by the world's greatest light specialists. Write for your copy.

Write for Trial Offer

Skybryte is guaranteed to win your prompt, enthusiastic approval. We are glad to prove it entirely at ou risk. Write for particulars of our trial offer. Also, let us send you names of concerns in your city who re-order Skybryte.

The SKYBRYTE COMPANY, Bangor Bldg., Cleveland, Ohio
Chicago Branch: 20 E. Jackson Boulevard

Digitized by Google



Simplifies the Power Problem in the Boiler Room

WHEREVER power is required to drive fans, blowers or stokers in the boiler room, the need is for an engine with the minimum of attention, low operating cost and dependable day after day service

That the Troy Engine is chosen for so many installations where small engines are required is proof of the Troy record of performance.

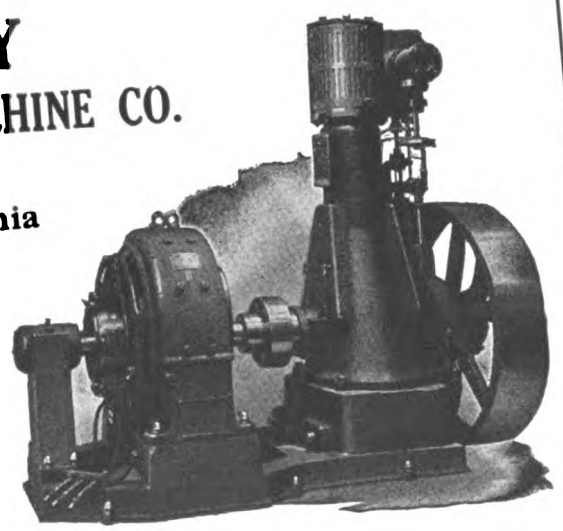
This reputation was built up by 32 years of specialization in the building of steam engines.

Troy Engines are safe engines—the balanced valve remains steam tight and sealed for years. It automatically clears the cylinder of condensate.

Troy Engines are economical in operation—bearings are oiled automatically. Troy Engines last for years—rugged in construction, compact and symmetrical in design.

The Troy Catalog will aid you in selecting the proper type for your requirements. Write for a copy.

TROY
ENGINE & MACHINE CO.
TROY
Pennsylvania



In sizes from 2 to 200 B. H. P.—Vertical, Horizontal, Belted and Direct Connected.

TROY ONLY STEAM ENGINES GOOD ENGINES ONLY ENGINES

New Use for the Bulletin Board

By GEORGE P. HUTCHINS

THE industrial bulletin board is the employer's logical direct advertising medium to his employees for the spread of accurate information and understanding, and the establishment of common though, purpose and action throughout the organization.

The printing press is the greatest motive force in the world today for business, for public opinion, for information and for education. Through the printed word, by the tested methods of advertising, the business executive can well establish a splendid measure of close contact and understanding with his employees. Publicity is just as fully capable of bridging the gulf between a management and its employees as between those same managers and the buyers of their products. A few clear-visioned employers have achieved the result. It is within the reach of all who will make the effort.

This discussion is confined to one medium only of such publicity—the bulletin board, the greatest unrealized publicity asset at the command of the industrial manager where the largest, surest and most direct results may be expected for the least expenditure of time and money.

It is capable of development in every plant until it becomes a positive, constructive influence of inestimable value—a bond of daily contact between management and personnel. It can restore a great measure of the personal touch which executives have lost with workers in large organizations and the loss of which is universally deplored as responsible for so much misunderstanding and hostility. It can be a powerful medium for asserting the employer's natural leadership.

The old precept, "Catch 'em young, treat 'em rough, tell 'em nothing," has long since been cast into limbo as a recipe for labor management. "Labor" may no longer be considered as an abstraction. Successful management finds its greatest success in the response of the rank and file of wage earners to the appeal to reason, intelligence, understanding and innate human impulse toward square dealing.

The one and only successful method of developing the partnership and coöperative spirit in an organization—whether large or small—*(whether that spirit is invoked in the interest of accident prevention, production, wage adjustment, working hours, managerial policies, stability, or loyalty in times of industrial disturbances)*—is to give the wage earners prompt, accurate and sufficient information and understanding such as any responsible business partner fairly expects and feels entitled to receive.

When men fully understand the facts and needs of any situation and clearly sense the trustworthy motives of their employers and executives, ninety-nine out of every hundred can be safely counted upon to be square and to do their part far more dependably than if they are working blindly.

Safety campaigns that show results are "sold" to the rank and file by patient education. The shops where scientific management has been installed with best results found the selling method to work better than the compelling method. The whole success of employees' representation revolves upon participation in responsibility through information. If you want men to work with you instead of merely for you, if you want them on the job instead of merely at the job, *tell them the facts.*

There is no simpler way than through bulletin boards to tell the workers what you want them to know for their own good and yours, what they want to know for their own peace of mind and confidence in you. Consider your personnel—whether it's a hundred men or ten thousand—as so many prospective customers for certain truths you want to

Digitized by Google

"sell" them. Inside publicity and good will are exactly as important for efficient production as customer publicity and good will are for efficient sales distribution. Therefore let inside publicity be handled with the same candor, attractiveness and skill as sales advertising.

To make a plant bulletin system 100% efficient, let it follow the recognized principles of first-class sales advertising. Several things unite to give sales-pulling power to advertising — originality, attractive display, omnipresence, striking, interest-arousing features, truth, information value, humor, forceful selling copy, personality, constant change, continuity and repetition.

Human nature is no different when working in the factory than when walking on the street or sitting in the home. Let the bulletin board publicity teem with the same vital appeals which turn business publicity into sales profit dollars. The publicity stake is just as high for the production manager as for the sales manager.

The bulletin board is a valuable medium for six distinct purposes:

1. Safety and health publicity.
2. Plant notices, rules, announcements and general working information.
3. For building morale, organization spirit and pride in the product.
4. For education of a general nature.
5. For the spread of specific information throughout the personnel on all matters of common interest and importance connected with the business or products.
6. For "selling" the management and its purposes to the rank and file of wage earners.

Any well devised and effective bulletin system should combine all six in such proper balance as best fits the needs of each particular group of readers or particular industry.

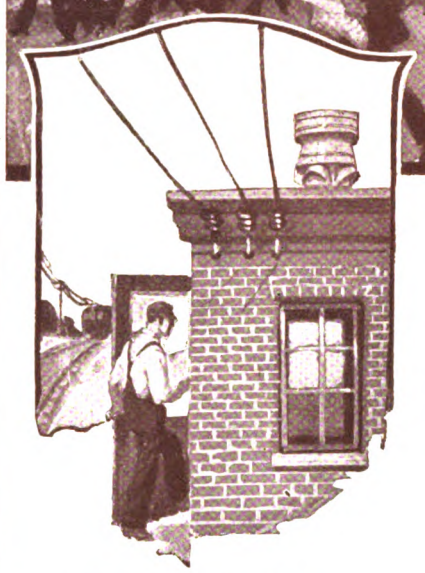
Why does every literate adult read a newspaper? To know what's going on in the world. The daily spoken or unspoken word on the lips of all humanity every day in the year is: "What's new?" What's new is news.

Of the four great rules for making a bulletin system efficient and resultful, the first and greatest is:—

Rule Number One: Make the bulletin board newsy. Change the matter every day if possible. Keep out of ruts, strive for the element of surprise and the all-compelling impulse of human curiosity.

Make the bulletin board so newsy, so interesting, so attractively composed that the entire body of employees will make a point of looking at them every day in order not to miss something worth while. If the employer or manager will appreciate what a tremendously valuable contact a live bulletin system affords him with his organization, the executive will see that this information service receives the skilled publicity attention it deserves. Workers cannot be critized for indifference to a bulletin system carelessly, irregularly and perfunctorily handled. Bulletin board space deserves to be treated with as much skill as if it were high priced magazine advertising space.





World-known leaders in every branch of manufacturing are found on the list of Arex Installations:

Carnegie Steel Company
Packard Motor Company
Bethlehem Steel Company
American Steel & Wire Company
American Car Company
Ford Motor Company
Armour and Company
Standard Textile Products Company
Studebaker Corporation
Stewart Mfg. Corporation
Semet-Solvay Company
Cadillac Motor Company
Corn Products Refining Company
Crane Company
International Harvester Company
Kelly-Springfield Tire Company
Sherwin-Williams Company
Whitney Glass Company
Pullman Company
Whiting Plover Paper Company
Gilbert Paper Company
Sinclair Refining Company
B. D. Rising Paper Company

Send rough sketch or blue-print of building with data for engineer's analysis



Arex ventilation is practical for an entire plant or a single room

AREX VENTILATION, being independent of expensive and cumbersome power equipment, is practical for the smallest buildings. In single-room power substations where heated air must be quickly removed from the transformers, Arex is indispensable. The specifications of the largest electrical companies in the country demand it.

And by virtue of multiplied savings, Arex ventilation is even more logical for larger projects. For more than fifteen years, Arex engineers have been freeing industrial buildings of every size, of profit destroying conditions—counselling with the executives of every industry to effect savings by the correction of ventilation.

The specification blank below will bring you, without cost or obligation, an analysis of your problem and recommendations by the Arex engineers. Attach a rough sketch or blue print of your building and mail to the Arex Company, Engineering Division, 1583 Conway Building, Chicago.

AREX COMPANY
J. C. Kernchen, Pres.
INDUSTRIAL VENTILATING ENGINEERS

Arex Ventilation Engineering Survey SPECIFICATION BLANK

We desire to receive *Gratis* an engineer's analysis of the following building: ..... *State character of work or business building is used for*

We are troubled with: Fumes ☐ Smoke ☐ Foul Air ☐ Heat ☐ Condensation ☐ Steam ☐

Dimensions of Building: Width.....Ft. Length.....Ft. Ceiling Height.....Ft.

Construction of Building: State whether Brick ☐ Concrete ☐ Frame ☐ Stucco ☐

Type of Roof: State whether Flat ☐ Slant ☐ Gable ☐ Sawtooth ☐ Monitor ☐

Pitch of Roof..... State how many..... inches to the foot.....

Location of Floor or Room to be ventilated.....

How high do adjoining Buildings extend over your Roof?.....

How many feet distant are the surrounding Buildings, or is your Building entirely unsurrounded? .....

....
Firm Name Name of Individual Title of Individual

....
Street Address City State

Digitized by Google

Rule Number Two is: Do not crowd the bulletin board. A few quickly read bulletins changed every day are far more effective than crowded boards. Follow the precept: "Be brief, that he who runs may read." The bulletin board should contain no more matter than an average workman can read, comprehend and digest in two or three minutes. What is sacrificed to brevity is always gained in display value and force. Follow billboard publicity methods; use as little type matter as possible, use pictures, diagrams, graphs and cartoons whenever you can. Eighty-five per cent. at least of all humanity is "eye-minded" and does not readily visualize printed words. Photographs or sketches should be employed whenever they can tell the story. The advertising expert knows the value of "white space" around copy. Blank space is equally important for well displayed bulletins.

Rule Number There is: Prepare and select your bulletins as much as possible from the "DO" angle rather than the "DON'T." The science of advertising and the science of salesmanship reiterate that *"affirmation is stronger than negation."* Positive statements always carry greater conviction than negative. Much safety and health publicity (as well as many plant notices) are necessarily of the "DON'T" variety. No manager can teach men caution by scaring them. Men will quit the job if it looks too dangerous and safety engineers know how much turnover is due to the witnessing of accidents and to fear inspiring safety publicity. Precisely the same mental reaction takes place in the matter of disciplinary notices, plant rules and announcements. Faith is infinitely a greater force than fear.

Rule Number Four is: Put a proper portion of humor, warm-heartedness and red-blooded virility onto the bulletin board. Make it good man-to-man selling talk which exudes personality and humanity and a recognition of the heart and intelligence and feelings of the man inside the overalls. Coldly impersonal and anemic communications should not issue on the bulletin board from a well disposed, cordial management to its employees whose good will they are trying to secure. No born leader would address his men in stilted, conventional phrase and measured rhetoric any more than a salesman would so address his customers. If yours isn't the "soulless corporation," which the radicals and agitators assert of all corporations, show its heart and soul to the employees on the bulletin board and make them feel your friendly interest. They want to believe in you and your friendliness but they're sparated from you by many barriers.

You've read advertising with the "personality punch" and brilliant individuality that has won your confidence for goods made by men you never saw. You can sell to the shop confidence in the office and a feeling of all-pervading personal interest in exactly the same way on the bulletin board. Use formal photographs of the authors or the events mentioned if need be to give a personal touch. Make

(Continued on page 33)



Coal and Ashes Handling Simplified

You can make the work of delivering coal to your boilers and disposing of the ashes one of the easiest tasks in your power plant, and at the same time reduce the expense to a minimum.

Handle them with Webster Conveyors, and combine the advantages which mechanical handling affords with the further advantages accruing through the general serviceability and low cost of operation and maintenance of Webster equipment.

We make all types of equipment for coal and ashes handling from the highly perfected Perkins Pivoted Bucket Carrier to the simplest flight or belt conveyor. Ask for one of our engineers to look over your present conveying methods.

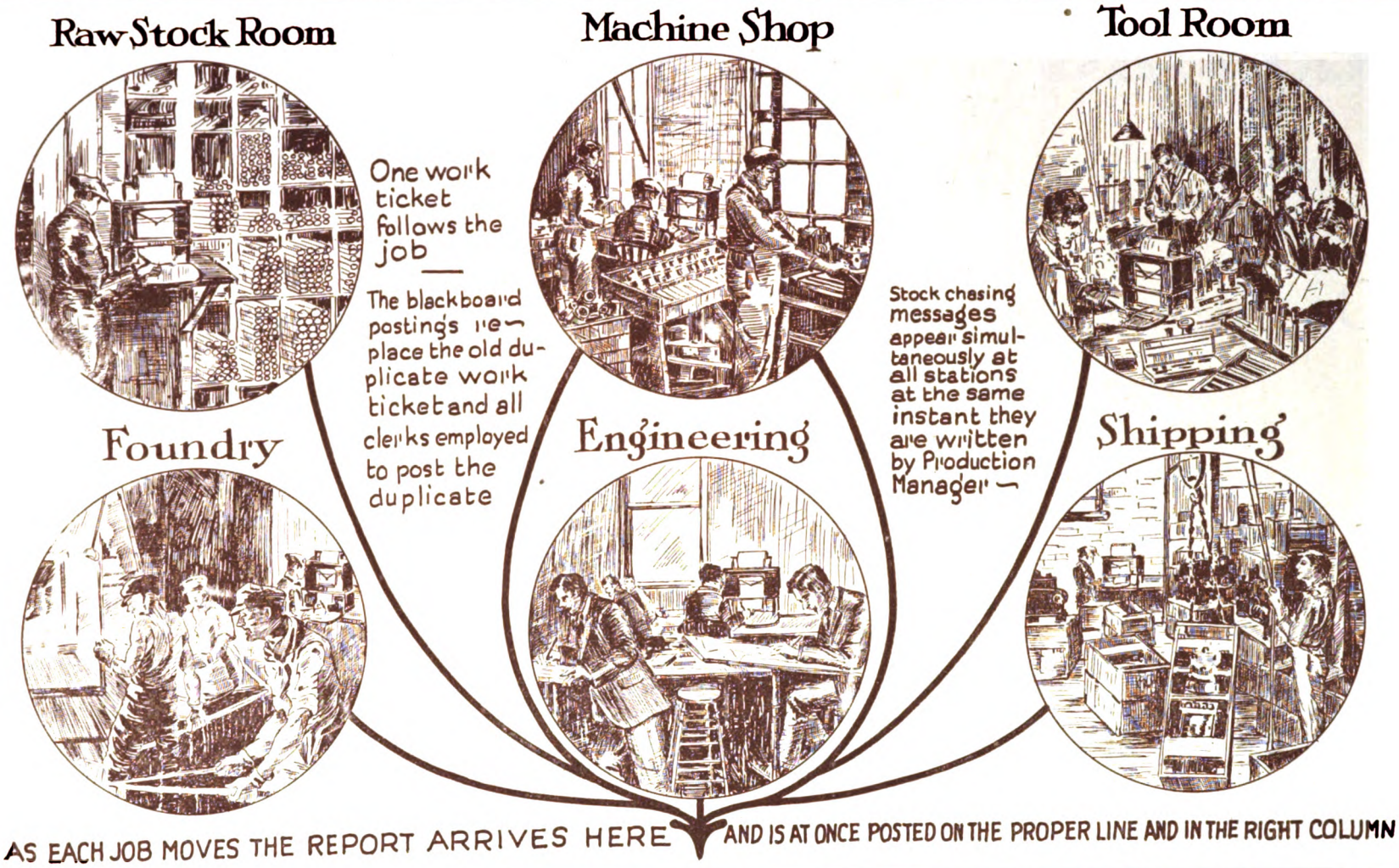
THE WEBSTER MFG. COMPANY
4500-4560 CORTLAND ST., CHICAGO
Factories-Tiffin, O. and Chicago - Sales Offices in Principal Cities

Digitized by Google

POST JOB PROGRESS REPORTS

LIKE THE BROKER POSTS "QUOTATIONS"! HOUSE MAIL IS TOO SLOW—STOCK CHASERS TOO COSTLY *TWO* MESSENGERS COST MORE THAN THIS

TELAUTOGRAPH SYSTEM





— PRODUCTION MANAGER'S OFFICE —

Write for our Booklet—No Obligation

TELAUTOGRAPH CORPORATION

General Offices and Factory—448 West 37th St., New York

Branches in 30 Cities *Service in 105 Cities*

Digitized by Google



Orange Ave. Terminal has cut heavy freight handling costs *in half* with Stuebings

There is a Stuebing Lift Truck in each section of the Orange Avenue Terminal (N. Y. Central R. R.). While awaiting call, loads of inbound freight are *kept piled on lift truck platforms*, conserving valuable storage space. Often, these platforms sustain loads of many tons!

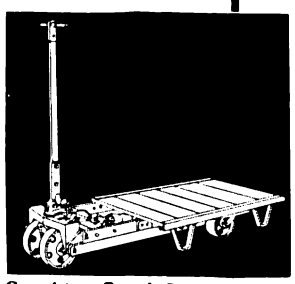
When call is made by consignee's trucker, it's an easy matter for *one man*, with the Stuebing, to pick up this *loaded platform* with one quick motion, and move it across the floor to the waiting truck.

It is done in almost the time it takes to tell it. One entire handling of all inbound freight is eliminated.

Time, labor and storage savings effected by the use of Stuebing Lift Trucks (operated with the trailer-train method of house distribution), *have cut in half the cost of handling this heavy freight.*

This is but one instance of many such savings. Ford Motor Co., W. F. Hall Printing Co., Western Electric Co., Globe Soap Co., and hundreds of like concerns in every field use Stuebing Lift Trucks because they pay for themselves over and over in the savings their use makes possible.

If you are not using Stuebings, a Stuebing representative can very probably show you a way to greater interior hauling savings than you ever believed possible. Write today.



Stuebing Steel-Bound Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble

The Stuebing Truck Company
Cincinnati, Ohio — Montreal, Que.

StueBing
LIFT TRUCK SYSTEMS

Digitized by Google

(*Continued from page 30*)

every printed word live and speak in the spirit of the personal talk. Use "selling punch and pep." No manager would expect, for example, mere "Safety First" placards and stencilled signs to instill the habit of forethought and careful conduct in accident prevention any more than he would expect his representatives' business cards or the company letterheads to sell the factory output.

Here is a superb opportunity for the executive who has the real human touch, who understands the psychology of labor, who has studied the philosophy of modern industrial relations, who is sincere in his desire to "get next" to his people, who is imbued with a sense of his responsibility as an employer, who knows the mental and spiritual need of workers, who properly appraises "man-building" as a basis for organization, who correctly estimates the potency of goodwill as an element of industrial efficiency. Make the bulletin board a mirror that will reflect the sunlight of understanding into the darkest corners of shop ignorance and hostility.

The advertising expert recognizes the extraordinary value of "preferred position." The pictorial supplements of our leading Sunday newspapers are the highest priced newspaper space in the world. They command from two to four times higher rates for their advertising space than are listed for "run of paper." Exactly similar results, from the standpoint of the workers' voluntary attention at the bulletin board, is gained by good general-interest pictorial material as the central feature of the factory bulletin board. A central interest feature is very important to real success.

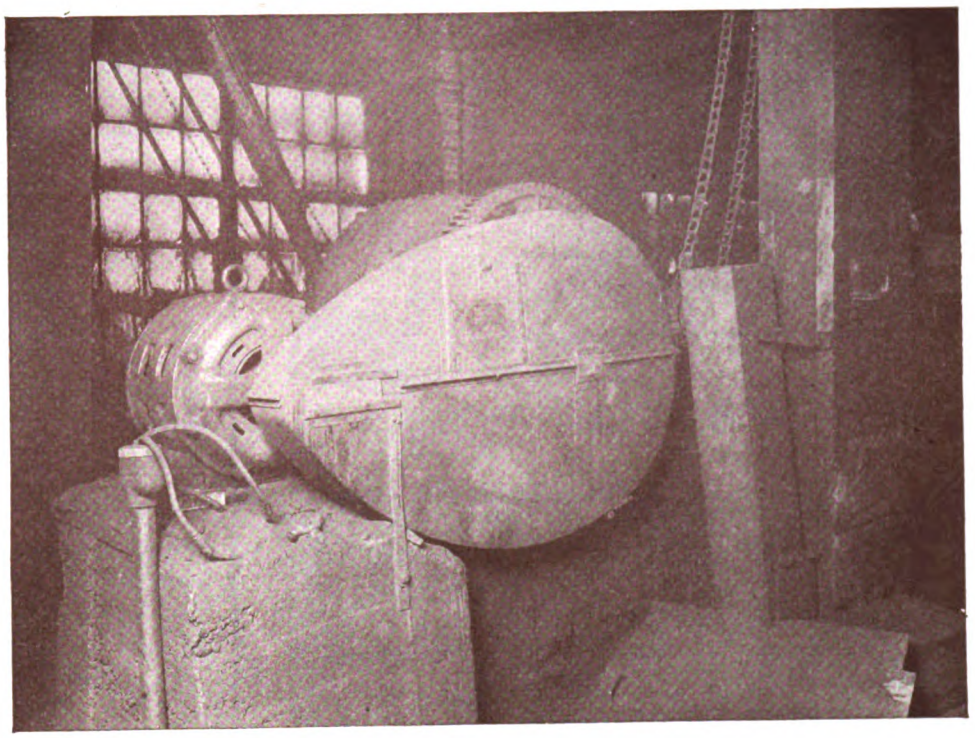
There is no possible form of "canned education"—whether it be syndicated house organ matter, pay envelope stuffers or bulletins—that effectively alone takes the place of straight management-to-man talks prepared and issued by each employer for his own people and dealing with their common problems. I believe sincerely in house organs. They offer a superb opportunity to develop esprit de corps, to teach accident prevention, to hold interest, to consolidate shop knowledge and opinion, and afford the workers themselves through their own contributions, a much appreciated chance for self-expression. The merits of the house organ, if edited with skill, are too well recognized to require an advocate. The sole criticism against the house organ is the tendency of many employers to place too much reliance upon such once-a-month publications and to expect altogether too much from them.

Most emphatically the house organ should be supplemented by a comprehensive system of daily bulletins of plant news. The simplicity and economy of the bulletin board method is self-evident. While the once-a-month house organ is necessarily an *incident*, the newsy bulletin board can be made an invaluable *influence*. Clearly influences are much more potent than incidents.

The bulletin board should be treated in the broad-minded spirit as previously recommended. The matter should

MORSE SILENT CHAIN DRIVES

THE MORSE "ROCKER JOINT"



Cut Transmission Losses
on Pulverizing and Grinding Equipment

Morse Drives are used on the following Pulverizing Equipment:—

Combustion Engineering Corp.
Fuller-Lehigh Co.
Kennedy Van Saun Manufacturing & Engineering Corp.
Locomotive Pulverized Fuel Equipment Co.
Allis-Chalmers Mfg. Co.
Chalmers-Williams Co.
Hardinge Conical Mill Co.

"Transmission of full power . . . . . consequent increase in production," writes the Smith Facing Company, Cleveland, concerning a MORSE SILENT CHAIN DRIVE used to transmit power to Hardinge Conical Mill.

This Company further adds:

"This installation, which is transmitting 25 HP on a direct drive on but 3½ foot centers, not only eliminated a counter shaft drive requiring 60 feet of 10 inch heavy double leather belting, pulleys, countershaft, and hangers, but saved us valuable space as well. Further, our slippage difficulties have been overcome.

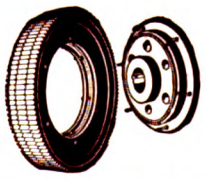
"Our satisfaction with the Morse Chain Drive is attested by the order you now have for the 75 HP drive for our Smith Tube Mill."

MORSE SILENT CHAIN DRIVES are the answer to EFFICIENT POWER TRANSMISSION.

MORSE CHAIN CO. - - ITHACA, N. Y.

Address Nearest Office

ATLANTA, GA...Candler Bldg., Earl F. Scott & Co.
BALTIMORE, MD.....1402 Lexington Avenue
BOSTON, MASS.....141 Milk St.
CHARLOTTE, N. C.....404 Commercial Bank Bldg.
CHICAGO, ILL.....Merchants L. & T. Bldg.
CLEVELAND, OHIO.....Engineers Bldg.
DETROIT, MICH.....7601 Central Avenue
KANSAS CITY, MO. Finance Bldg., Morse Eng'rg. Co.
MINNEAPOLIS, MINN., So. 3rd St., Strong-Scott Mfg. Co.
MONTREAL, St. Nicholas Bldg., Jones & Glasco, Reg'd
NEW YORK CITY.....30 Church St.
PHILADELPHIA, PA.....Franklin Trust Bldg.
PITTSBURGH, PA.....Westinghouse Bldg.
SAN FRANCISCO, CAL.....Monadnock Bldg.
ST. LOUIS, MO..Chemical Bldg., Morse Eng'rg Co.
TORONTO, Bank of Hamilton Bldg., Jones & Glasco, Reg'd
WINNIPEG, MAN., Dufferin St., Strong-Scott Mfg. Co.



Shear Spin Sprocket



Spring Sprocket

"Morse" Is the Guarantee Always Behind the Efficiency, Durability and Service

Digitized by Google



Above is shown a front door arch partly built up, showing how chunks of Plibrico are pounded into place.

The beginning of furnace economy

WHEN you have opened your first container of Plibrico Furnace Lining—then and not until then—you have started on the direct road to economical furnace operation.

PLIBRICO JOINTLESS FURNACE LINING

is a plastic lining that is installed with mallet and trowel. When baked it forms a jointless lining that is airtight, gastight, resistant to temperatures to 3,100 deg., and that outlasts ordinary fire-brick linings two to four times. Because of its putty-like form, Plibrico is ideal for baffles, arches and other special shapes

Warehouse stocks in 52 principal cities—see 'phone book.

Plibrico is delivered only in steel containers of distinctive appearance as shown above and below.

This 50-page book FREE



JOINTLESS FIRE BRICK CO.

1154 Clay St. Chicago, Ill.

WRIGHT HOIST



ARE you conserving Time—Energy and Costs in your Hoisting Operations?

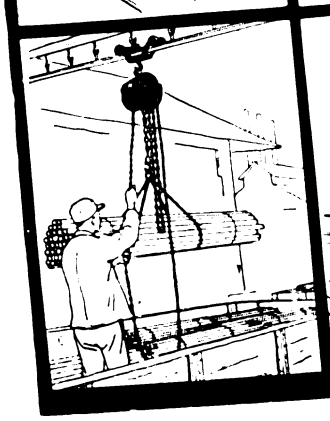
Wright Hoists are built to accomplish these results.

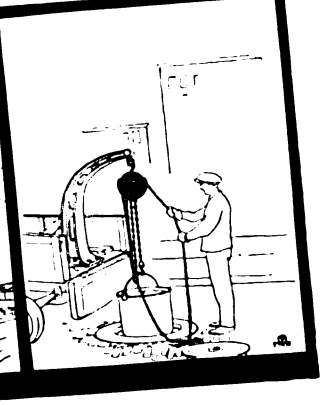
May we tell you how ruggedly they are built?

What's your name and address?

WRIGHT MANUFACTURING COMPANY

LISBON, OHIO





follow many lines and be free from monotony, considered purely in the light of an advertising or publicity problem.

It would not be difficult to list a hundred and fifty topics for an executive bulletin board talk every other day. There is, however, just one answer that can best be given to the topic question of what should be told to workers: Tell the workers all they ought to know to keep them interested, loyal, understanding, sympathetic, intelligent, contented coöperators and partners in your business enterprize. They especially want to know whether those profits are reasonable and commensurate with the business risk or whether they're 1,000% or 2,000% as so many agitators say. They want to know more about the raw material and the finished product. They want to know that the world finds worthy the children of their handicraft and skill; almost every human being thrives on and is energized by wise commendation. They want to know about big orders; about your competitors; about future products and markets. They want to know which department has done best or saved most or wasted least. They want to see some evidence of the employers' confidence in their judgment and skill and initiative. They want to see letters of commendation from customers. They want to understand a hundred whys and wherefores of business. They want to know the truth about national and international events which affect their factory's prosperity and something about the laws of economics and wages and living costs. The photostat offers a splendid method of presenting such matters in large display form.

The man who doesn't know how deeply all men long for such information and how square most men are in their hearts, and how much better most men work when they do understand, is tragically blind to the best impulses and instincts of human nature.

There are few workmen in the country who haven't been reached by the colossal propaganda of class hatred, malicious distorted arguments, economic fallacies and fanatical representations. There are relatively few workmen who have ever heard these misrepresentations contradicted. They have accepted what self confident and apparently well informed agitators fluently declare to be true and swallow it whole. When men are literally starved for facts it's no wonder they will swallow whole almost any fallacy presented as a fact.

There is just one known way to beat the agitator and that is at his own aggressive game. There's a perpetual active seller's market for discontent and unrest. There's only a potential buyer's market for Truth and Duty which calls for salesmanship and advertising. Let him who questions this contemplate that a few scant Americans go to church once a week while over 15,000,000 go to the movies every day!

The hope of this paper has been to outline the tremendous potentialities of the bulletin board for safety, for education, for coöperation and for good will. The bulletin board is the least expensive of all known methods of daily contact between management and employees. It is a direct and unfailing contact. No waste circulation—every reader a vitally important "prospect."

The success of bulletin board publicity is predicated upon its daily interest—reaching as nearly as possible every employee every day. That demands plenty of bulletin boards rightfully placed at strategic points. In large plants one bulletin to two hundred and fifty employees is generally a satisfactory provision. In many plants one bulletin must be provided for every 75 or 100, perhaps less. Remember this is fundamentally an advertising campaign and follow the rules that make advertising pull. The utmost cost of bulletin board publicity is but a microscopic fraction of the payroll—an almost immeasurable fraction of the cost of accidents, misunderstandings, ill will, labor turnover, spoilage, breakage, absenteeism and indifference. The employer freely spends thousands a year for the maintenance of buildings and machinery. Who can estimate how profitably he can spend

(*Continued on page 36*)

Digitized by Google

Photographic Record Paper

For COPYING MACHINES

Back to Pre-war Prices

THE RECTIGRAPH COMPANY manufactures its own photographic copying machines and coats its own photographic paper, the entire plant being devoted exclusively to this line. Due to a lowering of the prices of some materials and economies effected in our new plant, we are enabled to announce a reduction of 20% from the prices prevailing on photo-copying paper for some time past.

Revised Prices on Rectigraph Paper

ROLLS 350-FT. LENGTH

8½-inch width .	$10.68
9½ " " . . .	11.93
11½ " " . . .	14:00
12¼ " " . . .	15.45
13 " " . . .	16.00
14 " " . . .	17.59
15 " " . . .	18.84
18 " " . . .	22 00
18¼ " " . . .	22.90
24¼ " " . . .	30.45

F. O. B. ROCHESTER, N. Y.

Rectigraph emulsions are coated upon a high grade 100% rag stock, producing excellent results with a durable base. Rectigraph paper is a contrasty bromide paper with excellent orthocromatic qualities, and will reproduce colors perfectly. All the speed consistent with good quality.

The RECTIGRAPH COMPANY has always regarded acceptance of an order as a pledge that it would be filled at the earliest possible date. The output of our plant belongs to our customers with orders on our books. This policy compelled us, during the past few years, to decline much desirable business which would have been highly appreciated, but this could not be considered without prejudice to previous connections. Improved facilities in our new plant enable us to increase production and quality and to decrease manufacturing costs. ***Our Customers will benefit.***

It may be to your interest to become acquainted with Rectigraph paper. We would be glad to receive your order for a sample roll, spooled to fit your photographic apparatus. You can then judge of its merits.

Rectigraph Company

(*An Independent Corporation*)

ROCHESTER, N. Y.

INFINITE VARIATION OF SPEED QUICKLY OBTAINED

"The Reeves" VARIABLE SPEED TRANSMISSION

——REGULATES——

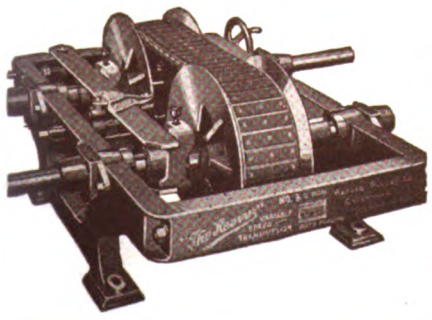
the speed of any machine or conveyor and enables the operator to get

FAST SPEED
MEDIUM SPEED
SLOW SPEED or
ANY IN-BETWEEN SPEED

desired even to a fraction of a revolution.

"The Reeves" Transmission is installed between the source of power—motor, line shaft or engine, and the machine to be regulated.

Any one speed may be maintained indefinitely or the speeds may be changed as often as necessary. It is possible to get a variation as low as 2 to 1 or as high as 16 to 1.



Put your variable speed problems up to us. Write for new 52-page catalog L.-44

REEVES PULLEY CO., COLUMBUS, INDIANA.

HALLOWELL

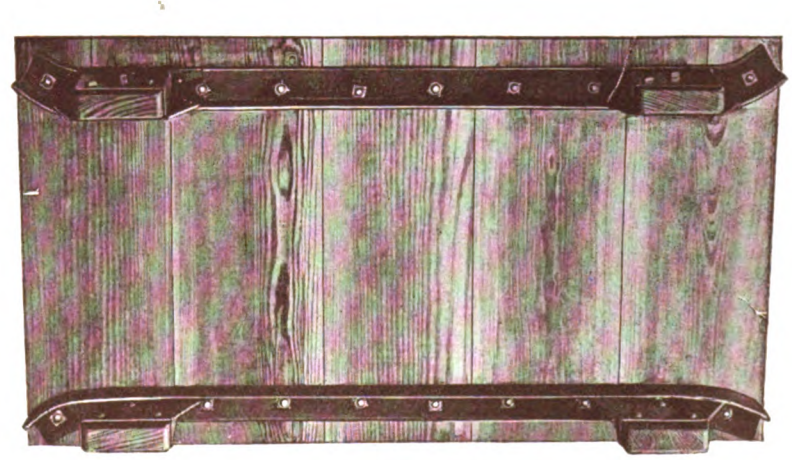
STEEL LIFT TRUCK PLATFORMS



Save Renewals and Repairs on Lift Truck Platforms BY USING THE "HALLOWELL"

From time to time the all wooden construction must be repaired, and finally complete replacement is necessary, therefore, the initial investment is only a small part of the ultimate cost.

The robust design of the "Hallowell"—heavy steel angles and leg blocks being securely joined by hydraulically driven rivets—renders it practically indestructible and, therefore, a very profitable investment.



Ends of runners are flared, as shown by above illustration, an exclusive "Hallowell" feature, which greatly simplifies entering the truck.

The value of this feature is soon realized by the workman after platform is put into service.

STANDARD PRESSED STEEL CO., JENKINTOWN, PA.

(*The "Pioneer" Steel Hanger People*)

INVESTIGATE

STANDARD PRESSED STEEL COMPANY, JENKINTOWN, PA.
Gentlemen: Kindly send me full details and prices of "Hallowell" Steel Reinforced Platforms.

Name .....

Company .....

Address .....

Truck used .....

Digitized by Google

(*Continued from page 34*)

on all means for the maintenance of MEN?

The usual bulletin board, whether on safety alone or with general posters, is not often read by over 15% or 20% of the men—and by them not every day. 85% waste circulation! That's bad advertising—wasteful, extravagent, sterile advertising. A bulletin board that is an ineffective advertising medium is expensive at any price.

An efficient bulletin system that reaches the great majority of workers every day keeps them interested and gives them the information they want is, in effect, a daily plant newspaper. It may be confidently expected to pay dividends of at least $100 on every dollar expended.

This bulletin matter is too important to be left to a cheap clerk or a mediocre subordinate. It's a chance for a top-notcher with real sales-advertising vision—a big opportunity for a big-calibre, brainy man to make his personality permeate the very life, thought and spirit of a mass of industrial workers. The expected results are in exact proportion to the publicity skill and man-managing ability of the man to whom this big chance is entrusted.

The manufacturer who has not "sold himself" or been "sold" on the worthwhileness of safety and health publicity, on promoting good will, loyalty, better understanding and closer personal touch with his employees, will do well to devote earnest thought to the foregoing suggestions. He should turn his thoughts inward upon his business, his production, his turnover, his accidents and the efficiency and loyalty of his organization and strive to see wherein they might be improved by the information and education of his workers.

For photographs in this issue, not otherwise credited, we are indebted to the courtesy of the following:

MOVING MOUNTAINS WITHOUT THE SHOVEL GANG

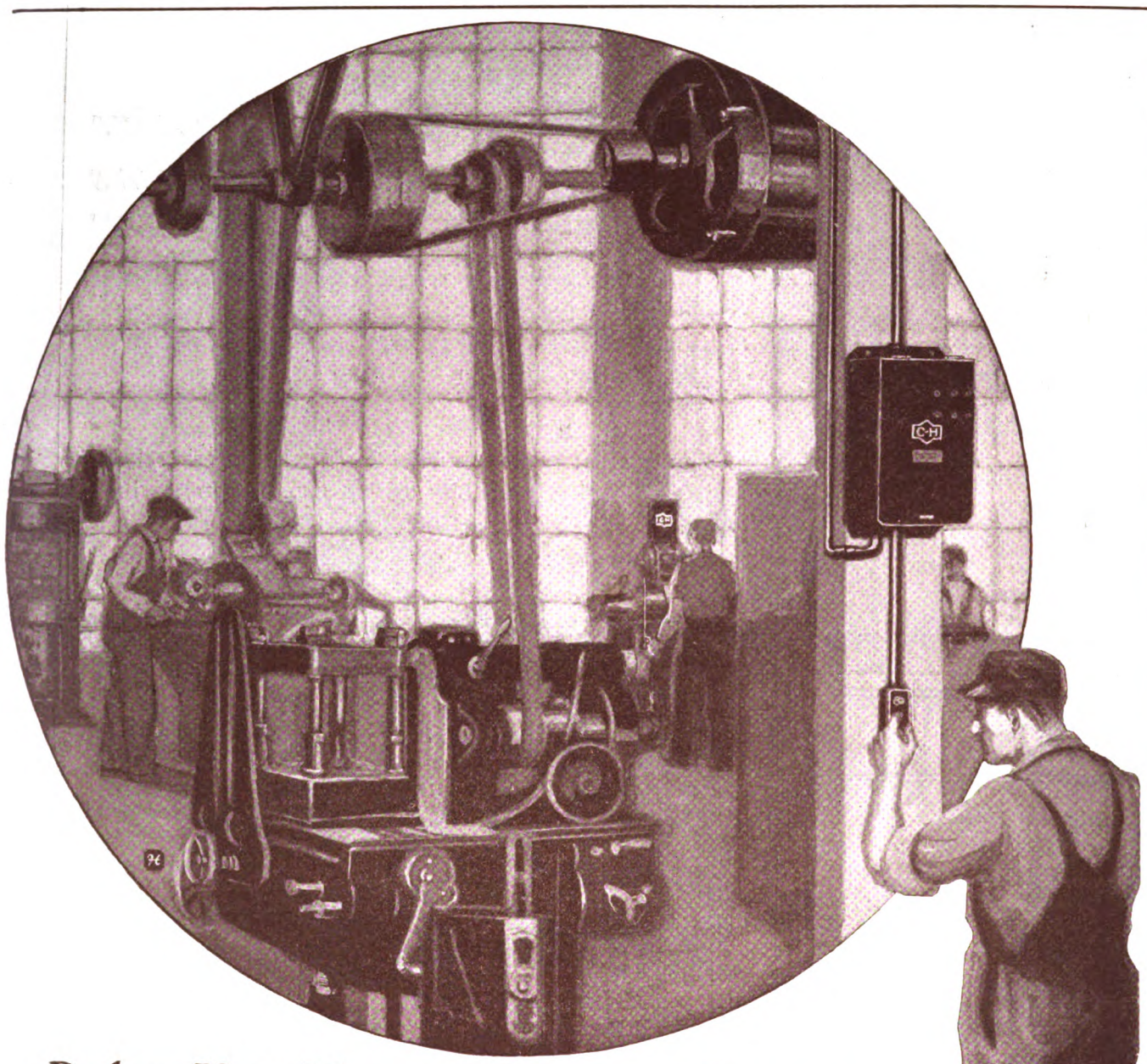
Barber-Green Company.
Chain Belt Company.
Dow Co., Inc.
Gifford-Wood Company.
Lakeside Bridge & Steel Company.
Robins Conveying Belt Company.
Webster Manufacturing Company.

PAINTING THE FACTORY

The Sherwin-Williams Co.
National Lead Co.
Protexol Corporation
The Hockaday Company.
Ingersoll-Rand Co.
Eclipse Air Brush Co.
Paasche Air Brush Co.
Spray Engineering Co.
The De Vilbiss Company.

THE LATEST ANSWER TO HIGH FUEL COSTS

Fuller-Lehigh Co.
Grindle Fuel Equipment Co.
Quigley Fuel Systems, Inc.
Combustion Engineering Corp.
The Raymond Bros. Co.
Bonnot Co.
Pennsylvania Crusher Co.



Reduce Your Motor Maintenance Expense

Prevent Production Delays

Today when every electric motor is needed to keep the wheels of production turning, it is important to prevent delays, motor burnouts and fuse troubles.

The C-H 9604 Automatic Starter for use with small alternating current motors has a number of advantageous features, which help to reduce maintenance expense.

The unique C-H Overload Relays are used in place of fuses—and thus the time lost, the trouble and expense occasioned by the blowing and replacing of fuses are saved.

They keep the motors on the job by preventing overheating and burning out of windings; they allow the necessary starting currents to flow, but at all times guard against overheating.

Attendants need spend no time or effort, and *safety* is provided to motor and men.

THE CUTLER-HAMMER MFG. CO.
Motor Control Department
Works: MILWAUKEE *and* NEW YORK
Offices and Agents in Principal Cities
Northern Electric Co., Ltd., Canada



For the control of pumping equipment, float switches or pressure regulated switches may replace the push button control stations so that pumping operations are automatically controlled according to water levels or pressures.

C-H CUTLER-HAMMER AUTOMATIC STARTERS
BULLETIN 9604 WITH MERCURY OVERLOAD RELAYS

Digitized by Google

Jack in Office

By P. B. McDonald

IN the United States there has always been considerable grumbling at the officiousness and rude manners of minor officials intrusted with a little brief authority. Such employees as hotel clerks, office boys, foremen, small bureaucrats, committee sitters, assistants and deputies of various kinds, and even honorable secretaries, are likely to assume the air of a captain of industry or an ante-bellum Kaiser. Patient American citizens too often stand in line and tolerate petty tyranny from some conceited blockhead whose proper place is driving a truck or swinging a sledge-hammer. As a rule, the pettier the job the more officious is the manner of the incumbent; the man higher up is likely to be human and courteous. An English visitor to America recently expressed his amazement at the courtesy and lack of pomp of our general managers and corporation presidents, while expressing surprise at the rudeness of the outside clerks with whom he had to talk before meeting the higher officials.

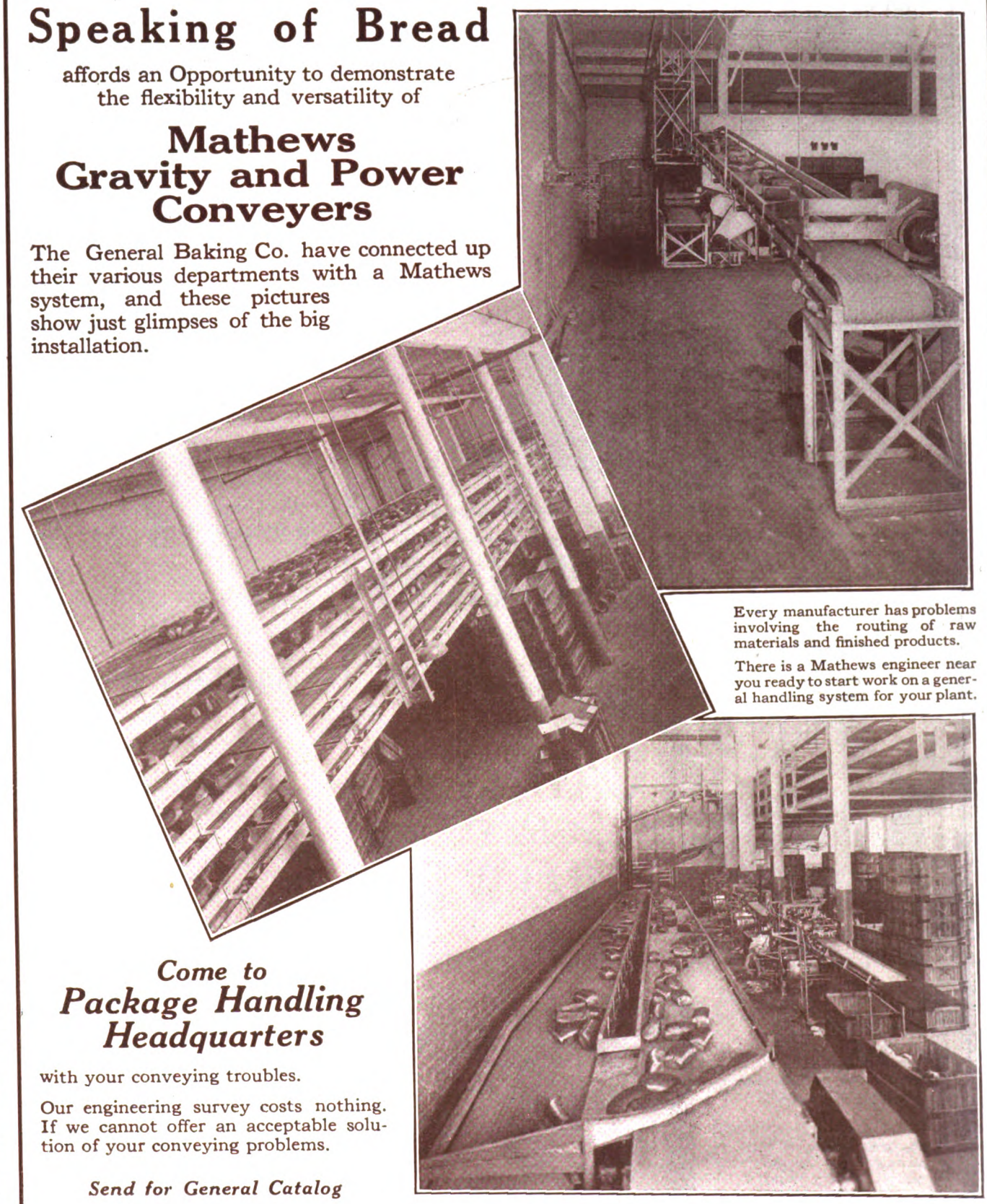
Yet the minor employee is not always a boor. Putting an ordinary small-minded man, full of Main Street ideas, into an office involving a little authority does not always have a bad effect upon him. On the contrary, it may turn a purposeless, shambling lout into a man who inspires respect and who takes pride in doing his work well—a sort of hero of labor. Look at the appearance of such a man out of work, or on strike, or even on his way to work, and then contrast it with the appearance of the same man doing work that appeals to him and that he can do well. The man out of work is likely to be an unlovely, ungainly figure with confused ideas and pathetic—even dangerous—possibilities; the same man at work—Jack in office—is a human being showing what he can do and that he is not averse to doing it. His self-respect impels him to exert himself and do as well as he can; he feels a certain satisfaction in seeing his assigned work done well. He wants to show overseers and onlookers that he has some ability and energy. One of the marvels of American industry is the ease with which an unknown man can appear in almost any industrial center, obtain a job with few questions asked, and become transformed from a colorless nonentity with no friends and little confidence into a useful, self-respecting worker—perhaps an official, a Jack in office. American employers deserve some credit for the sporting qualities that induce them to take an almost

Speaking of Bread

affords an Opportunity to demonstrate the flexibility and versatility of

Mathews Gravity and Power Conveyers

The General Baking Co. have connected up their various departments with a Mathews system, and these pictures show just glimpses of the big installation.



Every manufacturer has problems involving the routing of raw materials and finished products.

There is a Mathews engineer near you ready to start work on a general handling system for your plant.

Come to
Package Handling Headquarters

with your conveying troubles.

Our engineering survey costs nothing. If we cannot offer an acceptable solution of your conveying problems.

Send for General Catalog

Mathews Gravity Carrier Co.

Branch Factories:
Port Hope, Ont.
London, England

161 Tenth Street,
Ellwood City, Pa.

Digitized by Google

DIAGRAPH YOUR SHIPMENTS

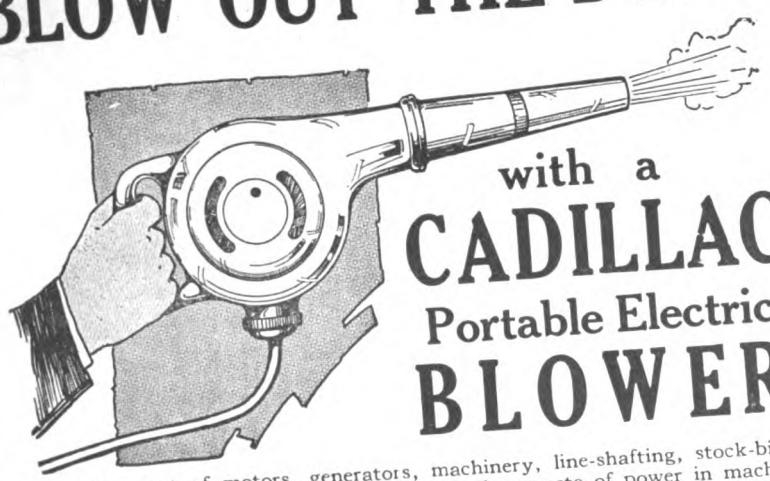
The Diagraph cuts legible address stencils for marking all packages, boxes, bags cans crates, castings and similar material. Addresses do not blur, wash or rub off. Safer than tags. A practical insurance against lost and delayed shipments.

Try one free in your own shipping room—price complete with all supplies, only $110.00 delivered, in either housed or open models. Order one on trial—no obligation to buy—we pay all charges.

DIAGRAPH STENCIL MACHINE CORPORATION
1625 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities. See phone books.



BLOW OUT THE DUST



with a **CADILLAC Portable Electric BLOWER**

Blows dust out of motors, generators, machinery, line-shafting, stock-bins, shelves, etc. Lowers fire risk, eliminates needless waste of power in machinery by cutting down friction, and creates more healthful working conditions.

A complete unit in itself. Requires no expensive installation equipment; operates directly from electric light socket. Weighs only 6 pounds and may be carried and used anywhere. No condensation as with compressed air.

A practical, economical blower of *proved* value. In daily use by leaders in every industry.

Write for descriptive folder giving prices, testimonials by leading manufacturers, etc.

ClementsMfg.Co.
612 Fulton St.
Chicago



Cleaning small motors. No condensation to short circuit motor and no excessive pressure to injure windings or insulation.

unknown applicant, determine what he can do, and intrust him with responsible duties that make him feel really a man.

Jack in office is usually willing to work long and well to discharge the responsibilities put upon him. He has a code that impels him to serve faithfully when responsible work is expected of him. The implied trust in his character appeals to his pride, and he is more moved by pride than by extra pay—strange as it may seem. The same love of petty pomp and officiousness that occasionally makes him unbearable is another aspect of his pride in his work. Moreover, his surly self-importance is sometimes only nervousness and may be a shell covering real amiability and earnestness. One European visitor in America remarked at the "discourteous kindliness" that he found—a rough willingness to help coupled with a blustering lack of fine manners.

The minor official then has his good as well as his bad qualities. His nature and mentality have been suggested by H. L. Mencken in his excellent book "The American Language," where the author describes typical Americans of the skilled labor class. After referring to "Joseph Jacob's composite picture," Mencken adds some ideas of his own. Jacob's picture (American Magazine, March, 1907) is that of a mill hand in a small city in Indiana, with his five years of common schooling behind him, his diligent reading of newspapers, and his proud membership in the Order of Foresters and the Knights of the Maccabees. Mencken adds: "Go into any port of the country, North, East, South and West and you will find multitudes of his brothers, car conductors in Philadelphia, immigrants of the second generation in the East Side of New York, iron workers in the Pittsburgh region, corner grocers in St. Louis, holders of petty political jobs in Atlanta and New Orleans, small farmers in Kansas or Kentucky, house carpenters in Ohio, tinners and plumbers in Chicago—genuine Americans all, bawling patriots hot for the home team, marchers in parades, readers of yellow newspapers, fathers of families, sheep on election day." Such is Jack in office, a type of American industry.

Making Real Vacations Possible

(*Continued from page 17*)

after themselves when vacation time comes, but too often the woman worker is apt to feel that she must spend any time she has free helping about the home, making a dress for herself, attending to her mending, or doing other such chores. Another factor is the increased cost of vacations. Though the salary and wage scale has gone up, many people who ten years ago thought a week or two in the mountains or at the seashore a necessary event in their year's schedule, now find the rates so high that they stay at home and save rather than spend. Many employment managers testify to the same experience—women coming back to work from vacations, tired and fagged, without that quickened interest and renewed energy that rest, recuperation, and change are supposed to give.

It is to meet one or more of these problems—to make it natural and easy and inexpensive for workers to get the most out of their vacation time—that many employers have provided camps or farms in the country where their people may go at a minimum of expense and get the maximum of recuperation.

An example of a company vacation establishment at its best is Camp Sherwood, in Orange County, New York, near the village of Warwick. It is the camp of the New York Telephone Company, established three years ago. Camp Sherwood covers several hundred acres of woodland and fields, has mountains, its own brook and swimming pool, and though tucked away in the foothills of the Catskills it is within easy traveling distance of New York. Hundreds of

(*Continued on page 41*)

Digitized by Google



Don't Let Hot Weather— Diminish His Efforts

HERE'S a real aid to production during the hot summer months.

Nothing like a cooling drink from one of these EBCO Bubblers placed at convenient points in your plant. They save unnecessary steps.

EBCO Bubblers are built solid, substantial and sanitary—no frills or excess parts. Their rugged construction means long life and economy.

EBCO Bubblers will make your plant an ideal place to work in and help in keeping *them* on the job.

Write for prices and illustrated catalogue.

The D. A. Ebinger Sanitary Mfg. Co.
W. Town St. & H. V. R. R.
Columbus [Ohio

Minneapolis, Minn.
Hampshire Arms

New York City
101 Park Ave.

Detroit, Mich.
3942 Commonwealth Ave.

Charleston, S. C.
258 Congress St.]

EBCO BUBBLERS



Cutting the Heavy Duty Cord Expense

Portable power machinery that requires varying lengths of cable can be made far more effective and less costly by the adaptation of the Heavy Duty Reelite. Cables dragged over floors and across machines, through oil and under the wheels of trucks quickly require repair—plus a loss of operating time for the machine itself.

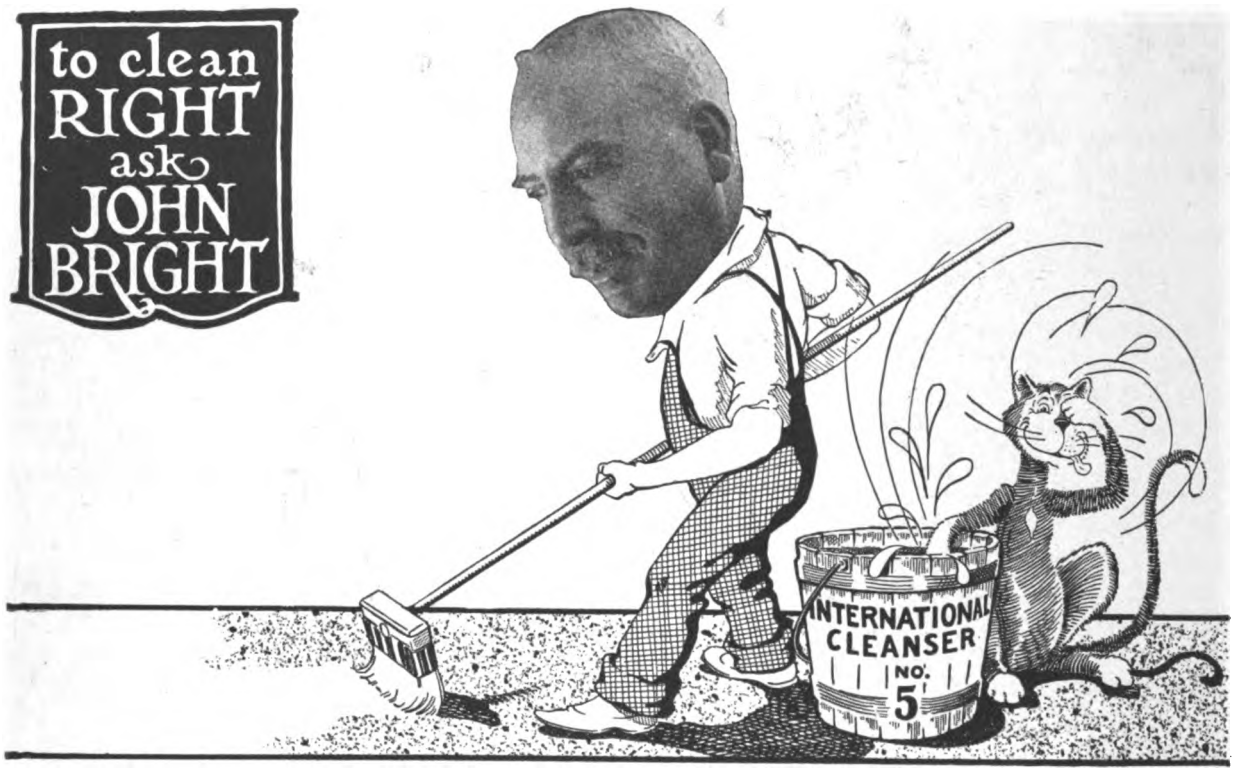
Automatically Reeled Clean and Unkinked

The Reelite is entirely automatic—it holds and automatically retrieves cable of any number of conductors required—in lengths from 10 to 125 feet depending on the size of the cable. Made in small sizes for use as adjustable fixtures—or to be incorporated as automatic cord retriever for portable tools. The Heavy Duty Reelite is furnished with 1″ male-threaded hubs and is readily adaptable for portable machines, cranes, dredges, mining machines, magnets, track welders, etc. If you are faced with a cord maintenance problem, our engineers' experience will be valuable.

APPLETON ELECTRIC COMPANY
1716 *Wellington Avenue*
CHICAGO

HEAVY DUTY Reelite
REG. U.S. PAT. OFF.

Digitized by Google



Let JOHN BRIGHT show you how to get floors absolutely clean—at less cost—in less time

EVER have trouble cleaning dirty, oily floors? Most every one does. Maybe you have even had to scrape them. Ask your cleaning men. They are the fellows I would like to talk to, but they will probably never see this advertisement—unless you show it to them. That's a good idea, why don't you.

Ask them if they would not rather use a cleaner which removed *all* the grease and grime from the floors, walls, windows and wood work; one which would clean faster and better than the cleaner they are now using; one which would not burn their hands and clothing.

Ask your P. A. what he is paying for general cleaners. Then figure what you can save by using INTERNATIONAL CLEANSER No. 5 at 6½ cents per pound, using one ounce to the gallon of water. Don't lay your pencil down yet. Figure that you can cut your cleaning time down so low with my cleaner that you won't need so many men for general cleaning.

INTERNATIONAL CLEANSER No. 5 is entirely different from the ordinary run of cleaners. It is a scientifically prepared compound with unusual emulsifying as well as saponifying powers. It cleans like magic—leaves floors absolutely clean where ordinary cleaners, lyes and other solutions hardly touch the surface grease.

My usual guarantee holds good. Try INTERNATIONAL CLEANSER No. 5 at our expense until you prove to yourself that you want to buy it. I would like to hear from some of you folks who have almost given up hope of ever having *clean* floors.

P. S. Ask me about any cleaning problem. That sign up above means just what it says.

Internationally yours
John Bright

International Products
IC
International Chemical Co

INTERNATIONAL CHEMICAL CO.

PHILADELPHIA ~~~~~ PENNA.

Digitized by Google

(*Continued from page 38*)

telephone girls go up there each summer, and for a nominal weekly fee—the camp is expected to be self-supporting—get all the advantages of country life combined with most of the modernities of summer-hotel conveniences. There are running water and shower baths. The girls live in rustic bungalows called "shacks" dotted about in the woods. But the shacks are wonderfully cozy affairs, equipped with such city things as closets, storm windows, window curtins, blankets that match, and all necessary furniture. It is true that the girls light their way to their shacks at night by kerosene lanterns—regular way-down-East stuff! But the main shack, where the eats are served in a rustic dining hall, and where there is a big fireplace to sit around, and easy chairs and roomy settles, books and magazines, a piano, a phonograph, and other take-it-easy equipment, has such luxuries as waxed floors and electric lights. Telephones? Oh, they are kept at the lowest possible minimum at Camp Sherwood. But all other conveniences are in abundance. There is even a stove with hot irons at the disposal of any young lady who wishes to do a bit of pressing.

Camp Sherwood shares the 420-acre estate which is its domain with an allied institution of the telephone company, Sherwood Hall. The latter is a large modern farmhouse used as a convalescents' home. It is for telephone girls who are just recovering from illness or who are run-down and in need of a rest. The Hall is kept open the year round and this fact is a big help to the Camp, for it means that cows are kept, and chickens, and a fifty-acre tract of the land is cultivated, thus insuring plenty of milk, butter, eggs, and vegetables.

Only a few miles from Camp Sherwood—so near that there are frequent visiting parties between the two camps—is Camp Isida where R. H. Macy & Company have a 102-acre farm as a vacation place for the girls employed in their New York department store. Camp Isida is in Sullivan county, New York, where the Catskill mountains begin, near the village of Burlingham. About 60 acres of the estate is wooded; the rest of it is cleared land and a ten-acre lake. The houses are on the shores of the lake—a Main House, which is camp headquarters; "Greenwich Village," a large dormitory with sleeping porches; and two smaller houses. The camp can accommodate 100 girls, and during the summer months it is generally full, overflowing at week-ends, and with waiting lists for possible vacancies.

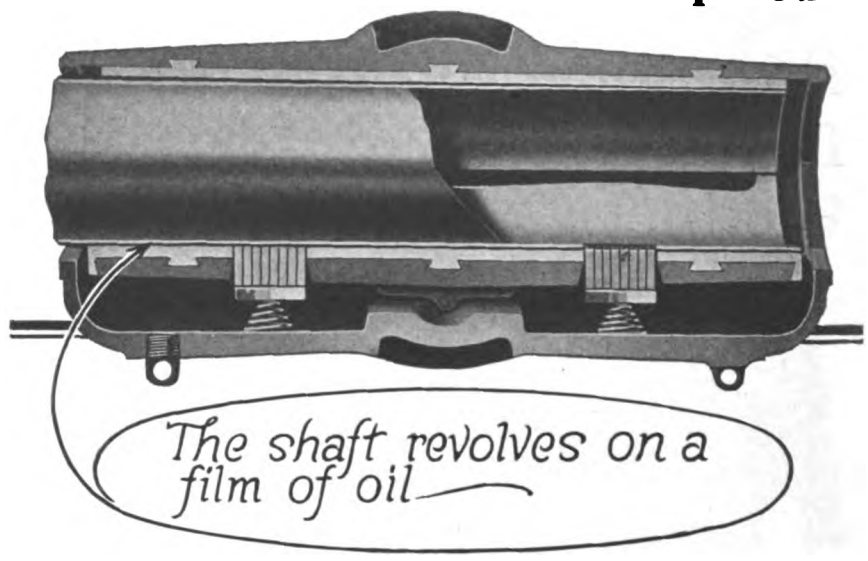
Camp activities here are systematically organized, though there is no compulsion about anything except the times for serving meals. There is boating on the lake and swimming, dancing, tennis, basket ball, hikes, pantomimes, picnicking, nature study-classes, and classes in first-aid. Every Friday night the camp members gather for a council around a huge camp fire, at which emblems are awarded for the week's winners in hikes and other competitive sports and activities. Fishing may be indulged in nearby streams. For those who simply wish to loaf hammocks are slung in the apple orchard.

While Camp Isida is owned and operated by the company, its rules and regulations are made and discipline enforced by a camp committee of thirty girls. This medium of self-government has been found to work remarkably well, and if any other company is considering the establishment of a vacation camp it would do well to consider this device. Somehow or other discipline seems to be better where the girls themselves, through their own elected committee, ordain the law and supervise its administration. Not only do the girls take more interest and responsibility, but there is a strong sense of proprietorship as a result of this self-government.

Camp Isida is exclusively for women. The Macy store also has a vacation place for its men near Bear Mountain, in the Palisades Interstate Park. This is Camp May-ga-lan-ka (Indian for Red Star), situated right in the heart of the Catskills-Hudson River country, eight miles from the River, more than 1,000 feet above sea-level, in the midst of world famous scenery. This camp is not owned by the store

(*Continued on page 43*)

Fill this bearing with oil every six months—no further attention required



The positive unfailing law of capillary attraction provides a constant, uniform and unbroken film of clean lubricant between the shaft and bearing lining—preventing bare contact of metals which invariably means excessive friction.

The action of the capillary oiler is non-agitating—dirt and grit settles to the bottom of the reservoir and stays there—it cannot reach the shaft.

The following illustrations show clearly the action of capillary attraction as it applies to the Dodge bearing.

The depreciation of Dodge capillary bearings is negligible—they will operate as efficiently and economically after twenty years' service under high speeds and heavy loads as when originally installed.



Fig. 1. Photograph illustrating capillary attraction between two glass plates standing parallel in oil. As shown, the oil has risen between the plates to a height above the surface of the oil in the tray proportionate to the distance between the plates.

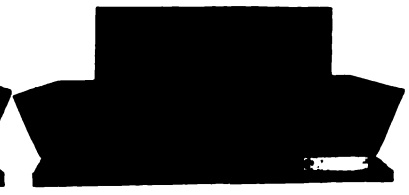


Fig. 2. Same plates as shown in Fig. 1 made to touch at their right hand ends only. Oil has risen to the tops of the plates at point of contact. These plates are in the same relative position as the surfaces of a Dodge Capillary Bearing.

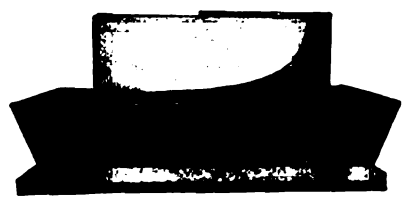


Fig. 3. To represent the shaft in a capillary bearing, a strip of glass has been laid on top of the two plates. Note the increased rise of oil in its endeavor to cover the top plate. It has the same tendency to cling to the shaft in a bearing.

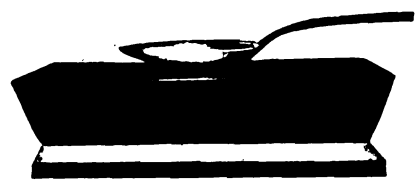


Fig. 4. A spoon supported one-eighth of an inch above the surface of the oil was depressed to touch the oil and was then allowed to spring back to its original position—the oil followed as shown. This same action takes place when the level of the oil gets below the bottom of a Dodge Capillary Bearing.

Specify Dodge capillary bearings for line and countershaft use—they are time tested and safe. Buy them from your local dealer.

DODGE

Power Transmission Machinery

DODGE MANUFACTURING CORPORATION

General Offices: Mishawaka, Indiana. Works: Mishawaka, Indiana, and Oneida, N.Y.

Dodge Manufacturing Company of Canada, Ltd., Toronto and Montreal

New York, Boston, Philadelphia, Pittsburgh, Atlanta, Cincinnati, Minneapolis, Houston, Seattle, St. Louis, Chicago, San Francisco

Digitized by Google

Job Time
Machine Time
Payroll Figures
Efficiency Records
Data for Piece Rates
Productive and Non-productive Hours

All this can be read direct from Calculagraph records

All of these results are obtained without copying or transcribing a single figure. With the Calculagraph it isn't necessary to struggle with a long piece of tape, or a large card or sheet, picking out from a confusing mass of figures workmen's numbers, job numbers and times of starting and stopping, or wasting valuable time in mental calculations and copying before the desired result is obtained. Calculagraph records are complete and easy to classify—just shuffle the cards and add the figures shown on the face of each card. An adding machine may be employed for this purpose.

If you don't know the Calculagraph—the machine which records starting, stopping and elapsed time—write for our booklet "Elapsed Time Records."

CALCULAGRAPH COMPANY

34 Church St. **New York City**



Digitized by Google

(Continued from page 41)

but is leased from the Interstate Park Commission, and consists of several sleeping cabins, a mess hall, and washhouse, all done in log-cabin style, nestling in the woods on the shore of Lake Tiorati. Camp life here is truly camp life, and persons whose vision of a vacation includes call-boys to answer pushbuttons, hot and cold running water, tennis courts, golf links, and the like, won't find what they want at Camp May-ga-lan-ka. Vacationing here means fishing and swimming, hiking, camp fires in the woods, and living pretty close to nature in a place where nature is at its best.

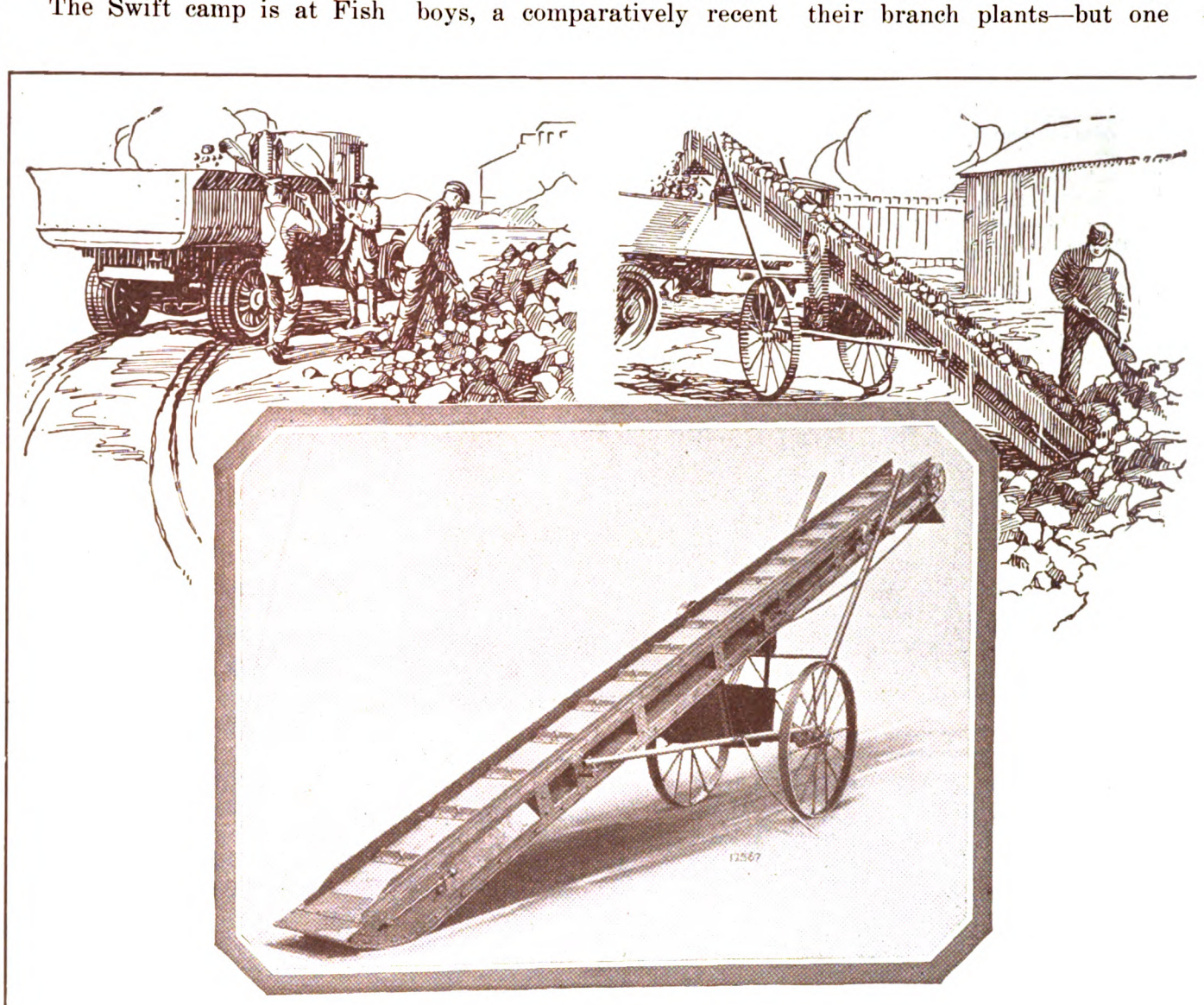
A missing feature at Camp May-ga-lan-ka is the kitchen. There is no cook, and no cooking done in the camp, other than the casual bacon broiling and fish frying around an occasional camp fire. Meals are supplied by the Interstate Park Commission (which serves a number of neighboring camps in the same way), are cooked at the Bear Mountain Inn, and brought each day by motor nine miles to camp. In spite of the long distance, the service is said to be quite satisfactory.

A more extensive and elaborate camp is that of Kaufman's, the Pittsburgh department store. It has an immense domain of 1,700 acres on a great natural plateau in western Pennsylvania more than 1,100 feet above sea level. The land is traversed by Bear Run, a famous fishing place for mountain brook trout, and one can follow this stream for five miles without leaving camp territory. The camp itself comprises a central club house and five cottages, the cottages being used mainly for family parties. There are also a dancing pavilion and several back-to-nature houses, the latter reserved for week-end parties. This camp has a capacity for 75 regular vacationists and 24 week-enders.

Among the pioneers in the vacation camp movement are the Chicago packing companies, Swift & Company and Armour & Company, both of which are large employers of women. The Armour camp is at Round Lake, a few miles out of Chicago, where the company has made full use of a beautiful setting, erected roomy comfortable buildings, provided all the conveniences of a summer resort, and yet kept the place a sheltered isolated retreat. Hundreds of girls and women employed in the packing plants and offices go here for one or two weeks each summer as guests of the company.

The Swift camp is at Fish Lake, which is really two lakes, and the camp is really three camps. There is one camp for women employed in the plant, and to it is assigned one of the lakes. Another camp, built on the shore of the second lake, is for women employed in the office. A short distance away is the third camp, for office boys, a comparatively recent addition. Each of the camps is equipped with substantial dormitories, with sleeping porches and recreational rooms, and there are diving piers, boats for rowing and fishing, tennis courts.

Both Armour and Swift have developed vacation camps in connection with some of their branch plants—but one



One Man Against Three

One man and a Jeffrey "Portable" can load a 5-ton truck in 10 minutes. Doing this work by hand takes 3 men 40 minutes. Figuring then the cost of labor at 40c per hour, the conveyor will load at a cost of 2c per ton against 16c per ton by hand, or an average saving of 14c on each ton loaded.

Rugged design, sturdy construction, ease of operation and economy of operation, fully qualify the Jeffrey Portable Belt Conveyor to completely meet, at low cost, the loading or unloading requirements of Industrial Plants, Contractors, Quarries, Retail Coal and Building Supply Yards, etc.

Send for a copy of Bulletin No. 369, which illustrates and describes the Jeffrey Portable Belt Conveyor in detail.

The Jeffrey Mfg. Co., 946-99 North Fourth Street Columbus, Ohio

New York, 2008 Hudson Terminal Bldg. | Chicago, 858 McCormick Bldg. | Pittsburgh, Rea Bldg., 622 Second Ave. | Montreal, Canada, Power Bldg.

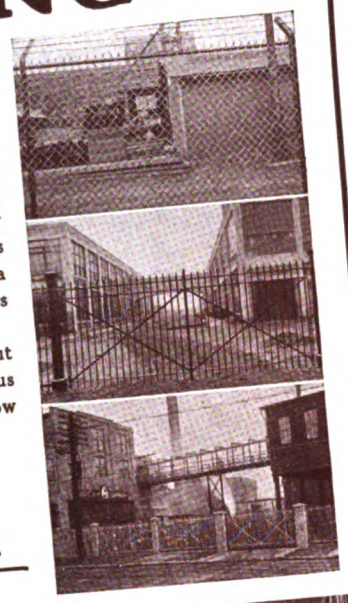
Locations of Other Jeffrey Sales Representatives

Cleveland, Ohio...828 Nat'l City Bank Bldg.
Denver, Colo.....1751 Wazee Street
St. Louis, Mo.....606 Pontiac Bldg.
Detroit, Mich.....455 Book Bldg.
Milwaukee, Wis.....M. & M. Bldg.
Boston, Mass.....141 Milk Street
Los Angeles, Cal.....H. W. Hellman Bldg.
Charleston, W. Va.....914 Kanawha Street
Scranton, Pa.....518 Union Nat'l Bank Bldg.

Digitized by Google

ENTERPRISE
All-Iron FENCING Chain-link

Costs Less Than You Think



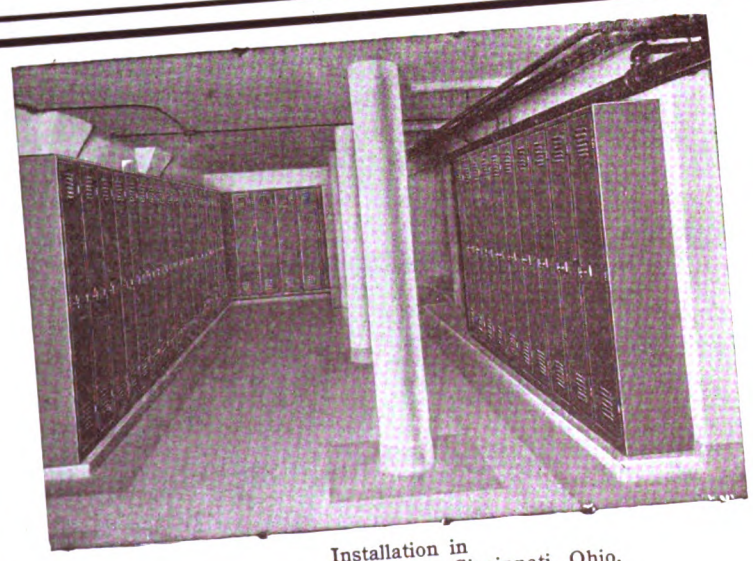
Even the original cost of Enterprise fencing is less than you imagine. And when you consider the advantages of its secure protection, the possibilities for expanding valuable outside storage space to your very property lines, in addition to the other opportunities for more efficient plant management, good fencing is a paying investment on which you "cash in" many times over.

Don't delay your needed fencing improvements, but write to-day for our catalog. Put your problem up to us —see a blue-print of the fencing installed and know the cost. Then decide.

Enterprise Iron Works

1110 E. 24th St. **Indianapolis, Ind.**





Installation in
Proctor & Gamble Plant, Cincinnati, Ohio.

THE good will of your organization is a very great, if intangible, asset. There is no better way to create this good will than by furnishing each man with a convenient, roomy Berloy Locker where he can keep his clothing and personal belongings safe from rodents, theft and dust.

While the outlay in money for an equipment of Berloy Lockers is comparatively small, the returns in good will and co-operation of employees are invaluable.

Our catalogue Y-50 will help you decide on types and sizes most suitable for your use. Write our nearest office for it today.

BERLOY STEEL LOCKERS

THE BERGER MANUFACTURING CO., CANTON, O.

Boston, Chicago, New York, Philadelphia, Kansas City, Minneapolis, St. Louis, Dallas, Roanoke, San Francisco, Los Angeles, Jacksonville

BERLOY

would have to go far to find so admirable a setting and so complete an installation as that of the camps which serve the Chicago plants and offices.

Somewhat different from the institutions described in the foregoing paragraph is the country house maintained by Guaranty Trust Company of New York at Patterson, a town in up-state New York. The primary purpose here was to provide a comfortable place in the country where employees of the company might go to rest and recuperate after an illness. But happily for many the Guaranty Country House is not exclusively a convalescents' home and illness is not a prerequisite for a visit there. Every summer, as well as in other seasons to a lesser degree, many of the workers in the big trust company and its branches go out to Patterson for one or two weeks' vacation.

The establishment at Patterson is a comfortable old farmhouse set in an estate of sixty acres. The house has been thoroughly modernized. There are orchards and meadows and oat fields, a trout brook, winding drives, broad acres lined with willows and maples, and the distant view of the Berkshires. The usual recreational facilities of country life are provided, but there is little of the "roughing it" of camp life here, the main thought being to afford the quiet restful surroundings and accommodations that one would get on a comfortable country estate.

Another New York bank undertook to provide a vacation place for its employees some years ago, with results not altogether successful. It secured a place on the Long Island shore, equipped the house, and opened it to employees at a nominal charge. Many took advantage of the house for week-end parties, but few seemed to care for it as a place for the regular summer vacation of two or three weeks. Investigation showed that most of the employees, when they went on a vacation, wanted to go somewhere new and somewhere farther away from home. The Long Island house was too familiar to them, and also too near the big city. Further investigation showed the bank management that only a relatively small number of employees were using the house for week-end outings. While it was filled almost every week-end during the summer, the group was composed of pretty much the same persons each time. Since the overhead expense of the place amounted to a tidy bit, which the rates charged did not cover, the bank finally decided to close the house. It was felt an unwise policy to maintain a place for the benefit of so small a proportion of the employees; and the house was finally disposed of.

There is a large business concern in New York quite famous for its personnel activities, which comprise many club and other welfare features. But this company has no vacation camp for its people. "We do about everything else for our employees," said the service manager here, "but vacation is one time when a fellow generally wants to be left to make his own plans. A company vacation camp would not appeal to our people at all; most of them want to get away from the usual crowd when they go for their annual rest and change."

The service manager of another institution took a different angle on this question. "Of course there are hundreds of our employees who make their own vacation plans without consulting the office, and who never use our camp. But there are hundreds of others who really do not know how to take a vacation. They are unaccustomed to country life; don't really know how to get the most out of the country. Atlantic City is many people's idea of a vacation. They go there, put up at some crowded hotel or boarding house, idle around on the board walk a few days, don't know what to do with themselves really, and come back home all tired out. They are only too willing to welcome advice on their next vacation, and far from objecting to a vacation with a group of their business colleagues, they welcome it, and dread the thought of being isolated among strangers. This is true of women workers, especially of those employed in department stores. For these workers, the vacation camp under company auspices is a great

(*Continued on page 46*)

Digitized by Google

DRY ROT

quickly destroys the wooden core of Tin Clad Fire Doors, leaving only a shell to resist the knocks and bangs that most doors receive and to prevent a furious fire from spreading should the emergency arise. Superficial inspection does not reveal this condition but - -

WHEN DISCOVERED

extensive repairs and very often replacement of the entire equipment is necessary at a great expense.

TRADE MARK

M & E "*ALMETL*" M & E

Reg. U. S. Pat. Off.

FIRE DOORS

are made of *steel - - galvanized and asbestos* welded and riveted to *heavy steel frames*

They Can't Rot

yet they *cost no more* than less durable equipment

Write today for illustrated catalogue

MERCHANT & EVANS CO.

Philadelphia, Pa.

Offices in Principal Cities

Just Suppose--

You had coming to you every month a big bunch of Pictured Progress such as you see in this copy of

INDUSTRY ILLUSTRATED

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name .....

Mailing Address .....

Company .....

Position .....

(Important confidential information—for our own records only)

ANNUAL SUBSCRIPTION $1

In Canada, $1.25; Foreign, $1.50

If You Are Interested in Cutting Cleaning Costs

Send for This Book

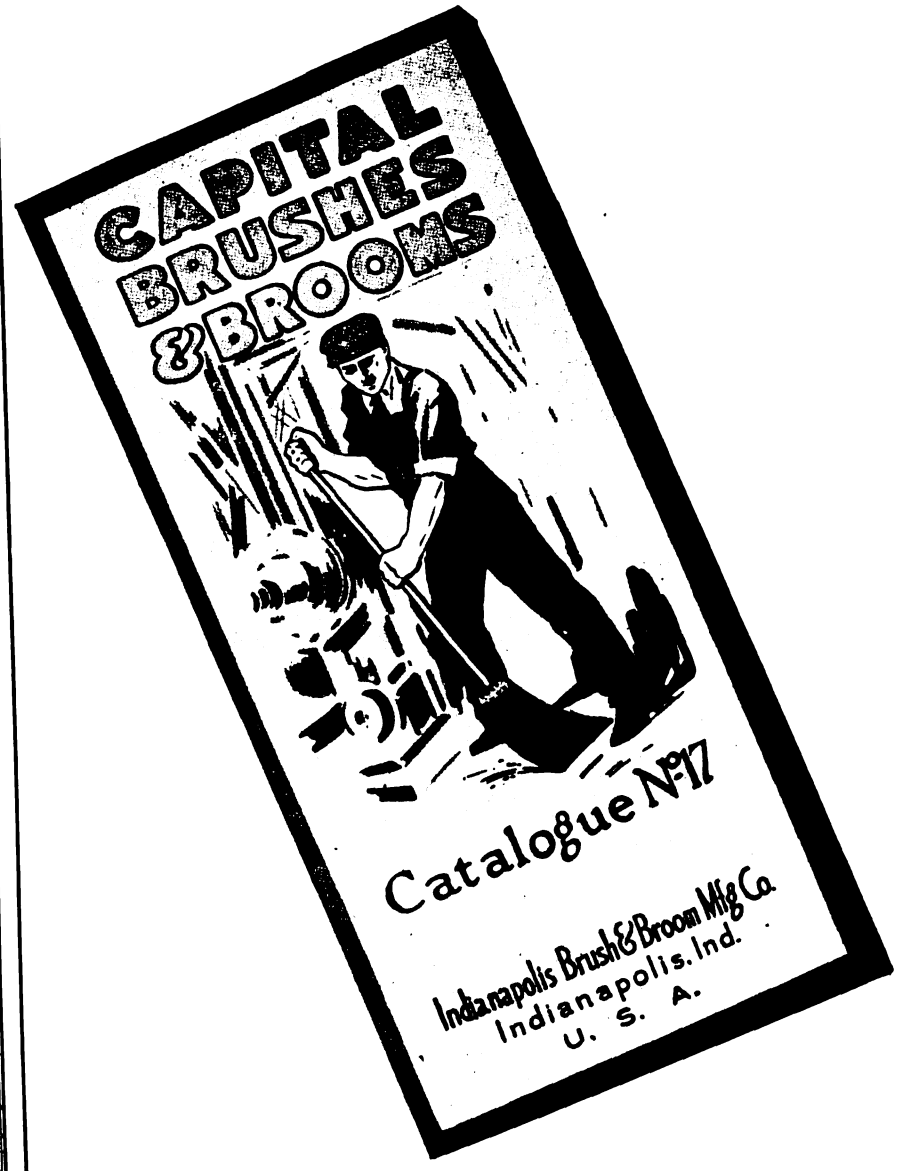
BY careful study of cleaning methods and requirements in factories, mills, shops, etc., we have perfected a line of brooms and brushes, each of which is built for a particular service. By using the CAPITAL Broom or Brush that meets your special needs, you can secure better, faster cleaning, at less labor cost. Moreover, specialized CAPITAL Brooms or Brushes will make a very considerable reduction in your purchase expense in this item of factory overhead. Countless tests have proved that they outwear two or three ordinary brooms or brushes.

Catalog 17 illustrates and describes the entire CAPITAL Line. Send for it today —and select the CAPITAL Brooms or Brushes that exactly fit your requirements.

INDIANAPOLIS BRUSH & BROOM MFG. CO.

I. W. LEMAUX, President

130 Brush Street **Indianapolis, Ind.**



Digitized by Google

(Continued from page 44)

opportunity and service, which they appreciate."

Another thing, pointed out by the service manager of a department store, is the great growth in popularity of outdoor life within recent times. It is only a matter of a few years that camps have had an attraction for the city working girl. The whole outdoor movement is new. Only twenty years ago large numbers of people were still rather suspicious of the open air, slept with closed windows, and lived in fear of a draft. We are different now, and the difference is reflected in our sports, our recreations, our vacation activities. Girls wear knickers and play ball quite as enthusiastically as they dance, and for these new accomplishments an outdoor setting is essential.

From the employer's standpoint there are other considerations involved in **company vacation camps**. The thing is an expense, for it is difficult to make the camp carry its overhead, even where rates are charged sufficient to meet the current expenses. For example, there is one company that has invested $120,000 in its vacation camp. Interest alone on the investment, figured at 6 per cent. amounts to $7,200 a year. Then, though the place is used only four months of the year, a caretaker has to be there all the year round, and his salary amounts to something. Besides, there are taxes, insurance, upkeep expenses of various kinds.

Some companies reckon the vacation camp as a regular service activity, and provide the vacation without expense to the employee, even going so far as to pay railroad fare to and from camp. This point of view is most prevalent among vacation camps for factory workers; though not all factory camps are free. Most concerns charge a regular weekly rate of board; in one camp it is as low as $5 a week; in another it ranges up to $15 a week. One company has a sliding scale of rates, the charge varying according to salary, though the board provided is the same for all.

Another problem is that of supervision and operation. A camp will not run itself, though as stated it is a good idea to ask the campers to assume some responsibility for self-government and leave with them the task of making and enforcing camp regulations. But a paid staff of several workers is required where the camp is of any size. Camp Sherwood, for example, last summer had a staff composed of 1 camp director, 6 recreational directors, 1 arts and crafts teacher, 1 dietitian, 1 nurse, 1 camp clerk, and 1 registration clerk—12 persons in all. And this of course does not include the help, both kitchen and house help and that employed in the garden. This camp is favored by its alliance with Sherwood Hall, the convalescents' home, for much of the farm help is attached to the Hall, though the camp shares the benefits.

Camp Isida, the R. H. Macy & Company vacation place at Burlingham, is fortunate in its supervision. The Camp Director here is a woman who was formerly dietitian in charge of the store's cafeteria in New York, so she was thoroughly imbued with the ideals of the



MERCURY TRACTOR AT ROCK ISLAND SHOPS SAVES $34.16 PER DAY

One Mercury Tractor with a few trailers has replaced a trucking gang of five men at the 47th Street Shops of the Rock Island Railroad, Chicago, Ill. Carefully kept cost records show that the tractor has cut trucking costs from 68c per ton to 8.6c per ton. In addition to maintaining a scheduled material movement between the various departments, the tractor finds time to push dolly loads of flues—to tow tenders to the track shops—and to peddle daily two tons of ice. This one tractor is actually saving $34.16 each day as shown by cost records

Savings quaelly as great are possible for other Railroad Shops. A Mercury representative will arrange an appointment at your convenience.



MERCURY MANUFACTURING COMPANY, CHICAGO, U. S. A.

Digitized by Google

store before taking up the camp work. Her husband is a graduate of the Cornell school of agriculture, and is superintendent of the camp farm. They live there the year round, farm the cleared land, and make it yield something beyond summer vacations. There is a chicken yard in connection with this camp, and in winter the eggs are sold to employees of the store.

As to the future of vacation camps: With the development of winter outdoor sports, which have made such strides in recent years, vacation camps will be considered not only for summer vacations but for winter vacations as well, and for week-end outings all the year round. This will remove the objection of those who think it poor economy to maintain extensive properties for use only a few months of the year. One of the business women's lunch clubs in New York, which maintains a club house in the country, had to keep its country house open most of the winter of 1922-1923 to accommodate the week-end parties of girls.

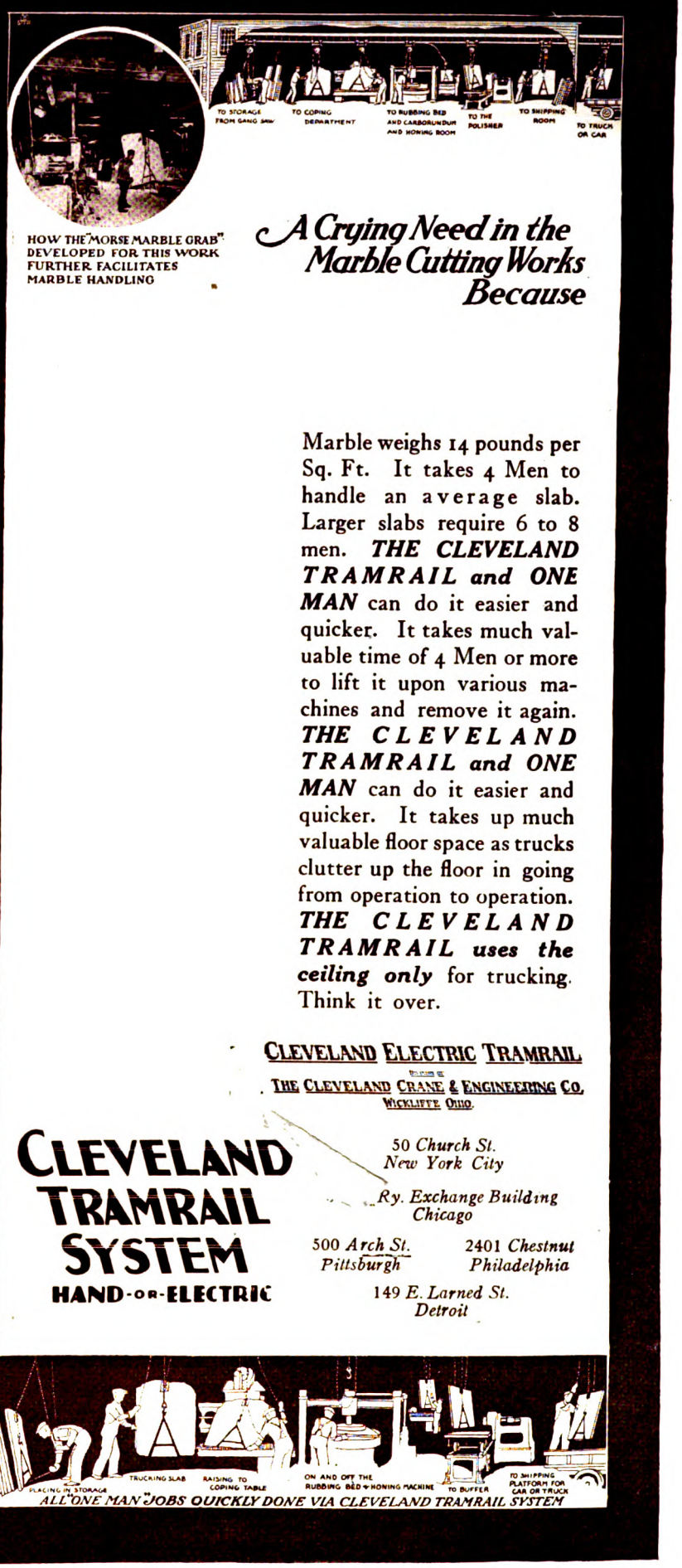
Company physicians are especially strong for regulated vacation places where the outdoor life is made possible, and much encouragement to the movement may be expected from them. Some of the companies named in this article are already developing plans for the enlargement and further improvement of their camps. The inquiries they get from other companies who are looking into the question indicate an interest on the part of the inquirers which is more than idle curiosity.

Keeping the Fire Demon Out of Your Coal Pile

(*Continued from page 12*)

garded as absolutely certain of success. Besides, the coal is damaged not at all or only in a very small degree. There is one possible objection and that is the coal comes out of storage in a wet condition. To some, this is no objection at all. Practical people have accepted this method. Thus, the Omaha Electric Light & Power Company, Omaha, Nebraska, constructed some years ago a concrete lined storage pit where provision was made for submerging the coal up to a certain level. The Underground Railways of London did a similar thing at the electric generating station at Lot's Road, only their container was constructed of steel. The Omaha pit can submerge 6,000 tons of coal and the London tank 15,000. Another instance is the big storage pit of the Duquesne Light Company of Pittsburgh which is located on Brunots Island. This is a large affair as the plan area of the pit is 800 x 150 feet and the depth is some 25 feet. The bottom is horizontal and the sides are set at an angle of 45 degrees. The United States Government may also be cited. That is, at the Panama Canal, the coal storage plants were constructed so as to provide for a large amount of submerged storage. It may be that the Navy has no special need for such storage because of the growing importance of oil, but the fact remains that the method of storing under water was regarded as quite the thing. The submergence provided extends to a considerable depth.

Where a big amount of coal is kept principally as insurance against strikes and other difficulties, submerged storage may seem very suitable even to those who wish to recover dry coal for the ordinary daily use. The submerged portion of the pile could represent the emergency coal, and there could be a dry pile on top which would contribute the ordinary supply. The coal would be wet for perhaps a foot above the level of the water used for submergence. Furthermore, if the water is under absolute control, the pile need not be subjected to any submergence at all, under ordinary conditions. Upon discovering that the pile was on fire, the water could be turned



Digitized by Google

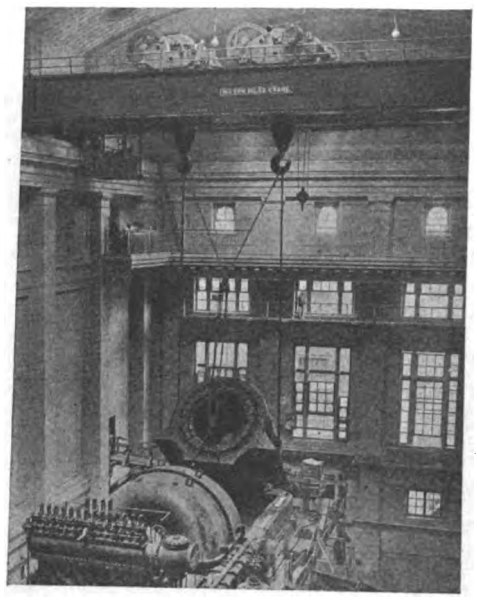
NILES CRANES

Save time—

Save labor—

Save space—

with modern crane equipment



THE CENTRAL STATION gives a service that is of necessity constant, one might say, perpetual. Any hour of the day or night, the closing of a switch must produce light.

Any shut-down of a generating unit means curtailed capacity. But these units require periodical overhaul in common with all other kinds of machinery. Every effort must be made to keep this lay-up time at a minimum. To this end, then, far-sighted designing engineers never fail to place at the aid of the repairmen, a proficient helper in the form of reliable electric traveling crane. And since reliabilty is paramount, no better choice can be made than a Niles Crane. Many such installations of our cranes in power stations all over the world bear witness to this.

For the Steel Mill Rolling Mill, Foundry, Shipyard, Quarry, Mine Yard, Locomotive Shop, Forge Shop, Central Station and wherever heavy materials must be handled with speed, safety and economy.

NILES-BEMENT-POND CO.

111 BROADWAY — NEW YORK CITY

CRANE WORKS— PHILADELPHIA, PA.

No. 2 *of a series illustrating the many industries served by Niles Cranes.*

Ask the Canadian Pacific about Canada

CANADIAN PACIFIC

Bureau of Canadian Information

The Canadian Pacific Railway through its Bureau of Canadian Information, will furnish you with the latest reliable information on every phase of industrial and agricultural development in Canada. In the Reference Libraries maintained at Chicago, New York and Montreal are complete data on natural resources, climate, labor, transportation, business openings, etc., in Canada. Additional data is constantly being added.

Development Branch

If you are considering the establishment of your industry in Canada, either to develop Canadian business or export trade, you are invited to consult this branch. An expert staff is maintained to acquire and investigate information relative to Canadian industrial raw materials. Information as to such raw materials as well as upon any practical problem affecting the establishment of your industry, including markets, competition, labor costs, power, fuel, etc., is available.

No charge or obligation attached to the above service. Business men and organizations are invited to make use of it.

Canadian Pacific Railway

Department of Colonization and Development

Windsor Station. Montreal, Can.

C. P. R. Building. Madison Ave. at 44th St. New York

165 E. Ontario St. Chicago

on and the pile flooded to the pre-determined level. The fire could be put out in this way and then the water could be drained off.

Of course, there are situations where the water supply is not under any especial control, as when the ocean or a river is depended upon to flood the pile to the water level of the surface of supply.

High piling is considered to facilitate spontaneous combustion; and yet fires have occurred even in the case of low piling. Anything over 12 or 15 feet is probably more or less dangerous. Fine coal seems provocative of trouble. This is probably due to two things. First, there is the great total surface of exposure when the mass is made up of fine particles. Then there is the probability that ignition is easier when the particles are small. Heat from near-by furnaces may be considered as an aid to oxidation and would thus promote the initial movement towards self-ignition.

When special means of securing immunity against the occurrence of spontaneous combustion can not be provided and the coal has to be stored in big pits, perhaps the best thing to do is to watch the piles. This may be done by the use of testing rods inserted here and there and left in except at times of inspection. If the lower ends of rods show a rise in temperature, the location goes under suspicion at once. Attention should be given to this and similar locations at fairly frequent intervals. If the temperature keeps on rising, the situation calls for treatment. If the coal can be dug out and burnt, this is a very good plan—one of the best. Treatment with a hose giving only a small stream of water may only result in wetting coal around the infected spot down in the pile. With coking coal a roof of coke is to be expected to form over the fire and constitute a kind of shield against water from above. Of course, if the whole pile can be flooded up to and above the level of the trouble, this can be relied on.

There seems to be more or less disagreement as to whether it is dangerous to store coal that is wet—as from rain. There is some evidence which points to the possibility that the storing of wet co... not the best practice. T... some years ago, two coal ... in bins that were along... each other were stored, the... with coal in a dry condi... the other with coal that ... wetted down as it was put ... don't know the depth of ... coal in these piles, but for ... days the temperature went ... in the pile stored dry until ... temperature level was nea... 400° F., when the experime... was halted lest the coal ... nite. A nice case of spontan... ous combustion was the o... way no doubt. With respe... to the coal stored wet, the tem... perature rose to 138° F., and ... then dropped. There is som... experience with Governme... storage that tends to substant... ate the foregoing. A certain ... U. S. Paymaster seems to hav... paid attention to the results ... storing wet and dry coal. ... Spontaneous ignition occurred ... in both classes of cases, but ... there was less trouble with coal ... that had been stored wet. It ... is proper to add, however, that ... there seems to be some evi... dence tending the other way. ... Apparently, we are not en... titled to come to a final con... clusion on this point. We can ... hardly view either coal stored ... dry or coal stored wet as im... mune against self-ignition.

There is a method of piling ... that has been recommended. ... I doubt, however, whether the ... matter has received full scien... tific attention. While that is ... being awaited, we may perhaps ... do well to consider the method. ... When the coal is being stored ... by the aid of the grab bucket, ... it is recommended that the in... dividual bucket loads be ... dropped at once and that in ... this way a small conical pile be ... avoided. It is thought that a ... big pile consisting of such ... small conical piles is im... properly constructed, and that ... it should rather consist of flat... ter masses. When the bucket ... is permitted to let go the load ... by degrees, there is, it seems, a ... tendency to form a cone, con... sisting of fine coal more or less ... separated from lump. The ... lump coal is thought to facili... tate the passage of air because ... of the partial absence of fine ... coal to fill up the voids. The ... formation of air vents through ... the coal would probably en... danger the pile because they ... would likely promote circula... tion and oxidation.

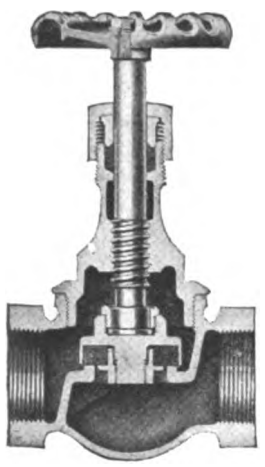
Digitized by Google

Made for maximum service not merely the average

TRADE JENKINS MARK

Jenkins Bros

Valve service that you demand



Sectional View, Fig. 106, Standard Bronze Globe Valve.

Jenkins Bronze Globe Valves are made for long service—they are strong, and constructed of fewer parts, each ample for the service for which they are recommended.

Jenkins Service can only be expected from genuine Jenkins Valves. Know them by the diamond mark and signature cast on the body of the valves—the symbol of valve perfection throughout the country.

Jenkins Valves are designed, made and tested, for the severest service in the use for which they are recommended, and include valves of bronze, iron and steel, for steam, water, air, gas, oil, and other fluids and vapors.

At supply houses everywhere.

JENKINS BROS.

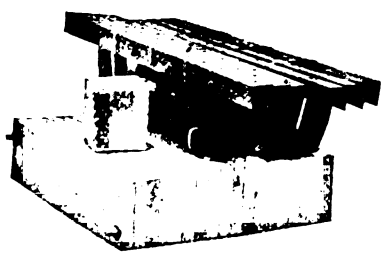
New York — Boston
Philadelphia — Chicago
Montreal — London
Factories: Bridgeport, Conn.; Elizabeth, N. J.; Montreal, Canada

Always marked with the "Diamond"

Jenkins Valves

SINCE 1864

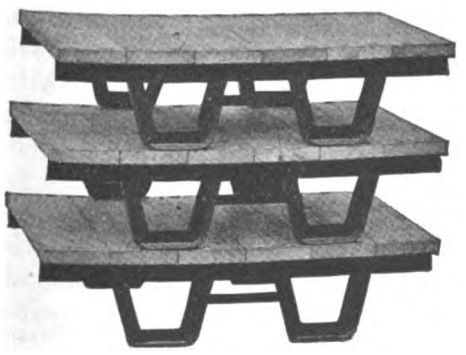
Shipped Anywhere at Low Cost



Above—3 Enterprise Platforms ready for shipment, showing why they take a Class three freight rating. Below—These same platforms assembled.

ENTERPRISE PLATFORMS for elevating trucks, hand or electric, are shipped anywhere at an exceptionally low cost. They come to you knocked down—take a Class 3 freight rating — which means a substantial saving on the shipping cost.

They will not break down under heavy loads like the all-wood platforms you make—and practically eliminate costly repairs or replacements. Enterprise Platforms cost so little and are built so strong you cannot buy or make platforms equ ally trong and durable for less money.



Ready to Assemble

Everything is complete, ready to assemble, with necessary bolts, nuts and washers. Top boards are finished on four sides, cut to length, bored and countersunk for bolts. No extras to buy—easily assembled in a few minutes. Send measurements today and get prices and descriptive literature.

Made in all Sizes

If you will give us the following information we will quote you promptly on a platform to meet your requirements:

Measurements Desired

Length of top over all .....
Width of top over all .....
Clearance between skids .....
Style elevating truck used .....
Height of truck base when lowered

ENTERPRISE IRON WORKS

1166 E. 24th St. Indianapolis, Ind.

ENTERPRISE PLATFORMS *For Elevating Trucks —Hand or Electric*

That air in contact with coal oxidizes it more or less seems to be indicated by the case of a certain coal mine in Great Britain. The temperatures at the bottom of the shaft were taken of the incoming and outgoing currents of air. There was found to be a difference at 17 Fahrenheit degrees. Now part of this difference could be accounted for by the fact that generally a shaft grows warmer and warmer the deeper down it goes. This has nothing to do with oxidation. In the present case, the depth of the shaft was such that about one-half of the 17 degrees could be explained on this basis. Then a very small amount could be accounted for by the presence of men and animals in the neighborhood. But this was insufficient to cover the entire balance, so that it would seem that the continued slow oxidation of the exposed coal was really a cause of part of the heat.

In order to know from time to time whether the temperature down inside of a pile is increasing or not, we may use the following method. We provide a series of temperature wells at intervals of 30 feet along the center line of the pile. A 2-inch pipe is used which is long enough to reach down through the pile and be driven several feet into the ground and also to extend above the top of the pile for a convenient number of feet. These pipe lengths may be made pointed at the bottom to facilitate driving. Before setting the wells, each piece of pipe has a series of five or six holes drilled into its wall, these holes being at intervals of 1 foot, one hole above the other and the lowermost one down near the ground. At the upper end each pipe length is provided with a cap. Assuming now that the pile is a long prism, flat on top and not more than 12 feet high, the wells will be accessible to a man whose duty consists in walking along the top and ascertaining the temperatures down in the pile. He unscrews the cap and lets down an armored thermometer which he permits to remain down for 10 minutes. In this period, the thermometer will presumably have acquired the temperature of the lower part of the pile. When it is withdrawn, if the reading is as



Wood Sole Shoes for Wet Floors Pay Big Dividends

Workmen feel better and do more work. For this reason Davenport Wood Sole Shoes are a profitable investment.

By furnishing your men who work on wet floors with Davenport Wood Sole Shoes you will be repaid many times over by greater production and less labor turnover.

Davenport Wood Sole Shoes

The Wood Soles of maple, are fastened to the uppers with wire, by a special process insuring long life under the hardest kind of use. All seams are sewed with heavy waxed thread and reinforced with rivets where the strain is heaviest.

No time wasted in putting on or taking off the shoes—either buckles or laces can be used.

Davenport Wood Sole Shoes are being recognized by leading industries every where as the ideal foot-wear for workers in such places. They are water—oil—acid—dust—and dirt proof. And they are the most durable shoes made.

Send for a sample pair of Wood Sole Shoes to-day. They save money for you from the start by increasing production.

F J. STAHMER SHOE CO.
2355 Boies Avenue
Davenport, Iowa

Digitized by Google

high as 140° or 150° Fahrenheit, then prompt attention is to be given, and the infected coal dug out. The six holes that are drilled in the pipe lengths may be of half-inch size.

The piles where the coal is stored may have sides that slope 1½ on 1. This will be considerably steeper than 45 degrees which is 1 on 1. With a 6-foot flat on top and a height of 12 feet, such a pile will be just 22 feet wide at the bottom. Some coal can be piled more steeply than others. Where the slope needs to be less steep than 1½ on 1, the base will accordingly be widened. It has been suggested that a white band be painted around the pipes to cover the interval from the 12-foot level to the 13-foot level. This white band, 1 foot broad, will then serve as a marker to show the storage man exactly when to stop piling.

When a number of such piles are to be placed parallel to one another, a space is to be left between rows to facilitate air circulating on the outside. A very good rule to follow, if it seems desirable or necessary to modify the dimensions already suggested, is to pile the coal so that no interior point will be more than 10 feet from an exterior, air-cooled surface.

If coal cannot be piled in prismatic rows, but must be stored in a single flat stratum, then the depth should be reduced—say, to six feet.

It is considered inadvisable to store coal immediately or very shortly after it has been cut out of the seam in the mine, as freshly mined coal seems to be quite susceptible to oxidation. The piles should be inspected for temperature not less often than twice a month, if there is any real danger of self-ignition.

The following rules will be of more or less service.

1. Store the coal only in low piles—under 12 feet.

2. Make the piles narrow at the base—say, not over 20 or 25 feet—and with a 6-foot flat at the top.

3. Provide temperature wells at intervals of 30 feet or less.

4. Pile the coal to a height of only 6 feet, if it is not possible to pile in long prisms.

5. Use temperature wells in this case also, setting them so that no point in the pile is more than 15 feet from a well.

6. In whatever way the wells are set, let their temperature near the bottom be ascertained every 10 days or every two weeks.

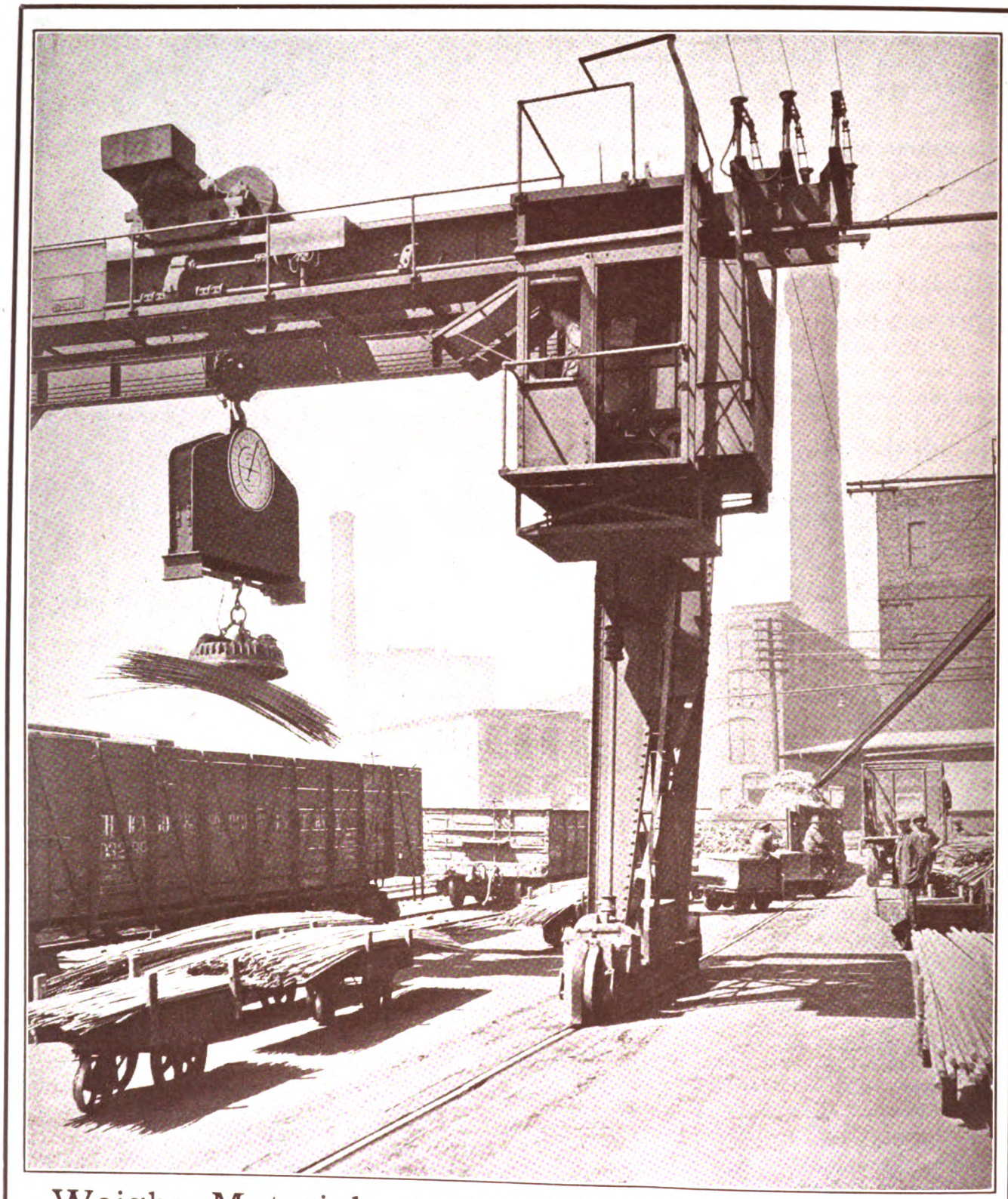
7. Avoid the inclusion of fine coal in the pile.

8. Dump the bucket load suddenly, so as to avoid building up small cones in which the coarse and the fine are more or less segregated.

9. If the coal contains sulphur in the form of iron pyrites, or in fact any other material having a strong appetite for oxygen, then the coal is to be very carefully stored and very carefully watched. After the lapse of two months, it is recommended that the coal be rehandled and rescreened. Further, it is advised that such coal be allowed to "season" for six months before going into storage.

10. Seek to locate the coal in storage where there will be no exposure to sources of exernal heat.

These rules apply mostly where the method of storage



Weighs Materials up to 30,000 lbs. on the move

This Kron Crane Scale, at the International Harvester Company's Chicago Plant, automatically weighs all materials unloaded by the electro-magnet. No extra attendant required.
A weighing problem such as this is only one of the many that the various types of Kron Scales have solved.
Let us help you solve yours.

AMERICAN KRON SCALE Co.,
430 East 53rd St. New York, N. Y.
CANADIAN KRON SCALE CO., MONTREAL, CANADA

Digitized by Google

falls short of that which depends upon submergence under water, which may be regarded as practically ideal in so far as the prevention and control of self-ignition is concerned.

The writer recently addressed an inquiry to the Omaha Electric Light & Power Co., for whose service the wet storage pit illustrated in this article was constructed. The point raised was whether their experience had been satisfactory. In reply, under date of April 16, 1923, the General Superintendent of the Nebraska Power Company, the present owners, says:

"Most of the coal we purchase in this part of the country could not be stored in any other manner with safety and the coal pit has therefore fulfilled the function for which it was purchased."

Shooting Big Game, Pictures, and Cement

(*Conti nued frcm page 21*)

Between taxidermy and facing the crumbling walls of the Culebra Cut with indestructible concrete, or shooting up great Government warehouses at the seaports almost overnight during the war—what is the connection? What has the goggle-eyed stuffed lynx I remember in the dusty shop window near my boyhood home to do with twentieth-century Erie Canal Barges, beautiful bungalows in California, and great sea-walls that defy the ravages of storm and frost and insects on the stern and rock-bound coast of New England? The connection is not a long chain of intermediate links; it has just one link. If there be a moral to this brief sketch, it is a moral for fathers: Let your boy follow his bent, whatever it be, however far removed it may seem from the practical affairs of life he will have to face in manhood. Civilization is being built up by the broadening of man's powers through discoveries and new uses of Nature's powers. And the new must, in the nature of things, come from the unaccustomed, the imagination, the unobvious—the impractical, if you please. Give him his head. His head is his own.

Carl Ethan Akeley was born on the 19th of March, 1864, on a farm near Claredon, Orleans County, New York. When he comes to die, he is afraid it is more likely to be from the perils that stalk the streets of the cities of civilization rather than from the lesser dangers of the African jungle where he is at least as much at home among the wild animals and savages. Roving free as a country lad, he hunted rabbits and chipmunks, squirrels and quail,—sport for which every city boy envies the farmer boy. And there he found his boyhood passion, his life work. Tracking his quarry, the battle of wits between hunter and. hunted, the true shot which ended the chase, these were exciting enough, to be sure. But this boy soon found something more than the ephemeral thrill in the close observation, the learning of the ways of wild birds and animals which the hunter necessarily acquires and practises. Instead of mere means to the end of killing the game, to him these became the interesting thing.

In a crude way he stuffed the skins and mounted them. What he did when it came to the eyes doth not appear. When, as a boy of sixteen, he announced himself to the world as a taxidermist, by way of those bravely printed cards, probably he was as good as all but a very few professionals of that time. Having finished school and looking for employment, a wise friend suggested that he might find a congenial place with "Professor" Ward of Rochester, who did an extensive business in taxidermy. He did. The "state of the art" in those not very remote days may be judged from the fact that when a skin was to be mounted it occupied practically the same position in the economic or social scale as a rag bag. That is to say, it was stuffed with hay, straw, hair, rags and



Stronger—part for part

JUST what does it cost you to move materials in your plant. Bring it down to the rock bottom basis of figures. Consider truck maintenance and operation, help required and power consumed.

The high power of controlled moving air will transport many of your light materials saving you many dollars.

And there are many other places where moving air will serve and save. It will collect dust and purify the air of shop and office alike, reducing the ever imminent fire hazard. It will draw off waste heat turning it to drying and heating purposes and boost the capacity and efficiency of boilers.

You can increase production and reduce costs—if you choose sturdy enduring Clarage-Kalamazoo Fans and Blowers—and secure the economy that comes with long service.

Part for part they are stronger than any other competitive type—let a Clarage harness moving air for profit in your plant.

Let our engineers correct your troubles.

CLARAGE FAN Co.

KALAMAZOO MICH.

New York City, Minneapolis, Cleveland, Pittsburgh, Detroit, Memphis, Los Angles, Philadelphia, St. Louis, Boston, Chicago, Indianapolis, Rochester, N. Y.

Complete stocks carried in New York, Pittsburgh and Memphis

CLARAGE KALAMAZOO Multiblade Fans



The Book!

—Waiting for your request. It tells you how to harness moving air—

Ask for it

MAIL THIS COUPON FOR FREE COPY Ind. Ill 6-23

Clarage Fan Co., Kalamazoo, Mich. Send a copy of your booklet explaining the possibilities of moving air.

Company.....

Address.....

Your Name.....

Digitized by Google

ELWELL-PARKER



HAND OR ELECTRIC TRUCKING?

Time has nearly passed for choosing.

ELWELL-PARKER

Electric Industrial Trucks and Tractors

are available now but—common labor is not.

ELWELL-PARKERS

lift, carry, and place the loads where wanted.

They will deliver eight times the load at three times the speed of a hand trucker.

They are always ready, work early and late. Many operate 23 hours per day.

60% of all handling can be done by these units. May be driven practically any place a hand truck can be pushed.

Thousands in operation in over 200 branches of industry in 23 different countries. Tried and proven equal to every inside haulage requirement. Many have been in continuous service for over 10 years.

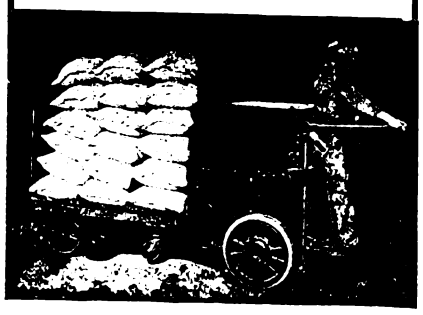
ELWELL-PARKER

trucks are guaranteed to save from the very start.

SELF-LOADING TRUCKS
DUMPING TRUCKS
CRANE TRUCKS
LIFT TRUCKS
TRACTORS

Our unobligating survey is yours on request, or ask for Bulletin 51.

ELWELL - PARKER
ELECTRIC COMPANY,
CLEVELAND



paper. The skull and the leg bones usually were inserted. When it was packed full, when the glass eyes were in place, and the whole wired or nailed to a board so it wouldn't fall over, it was a finished job, ready for the customer's mantel piece, or for the natural (!) history museum. "No such idea as that of studying the anatomy of the animal, as a basis for posing it, had ever occurred to the mind of a taxidermist," says Mr. Akeley. Very likely no taxidermist ever had approached the practice of his profession by the route which led this boy into it—long observation of the animals in life and action, so that he knew intimately how they should look when mounted in order to be lifelike. It was natural that a boy who had thus studied his subjects in the field should dig into the writings of others who were his kindred spirits in the study of wild animals, and by that means increase and co-ordinate his knowledge of anatomy, coloration, habitat and distribution of species, preservation of skins, and everything else that would put solid, scientific foundations under his temperamental inclination to preserve the wild things of the fields and woods with fidelity to life.

So he grew both ways, like a good tree, striking roots deeper and deeper down into the sources of knowledge, and branching out in originality. His first creative work consisted in posing his stuffed animals in natural attitudes and groupings. Then he went a step farther and painted, perhaps rather crudely at first, backgrounds which represented the season of the year and the other natural surroundings in which the subject would be found in life under the circumstances indicated by the condition of the animal's fur, its sex, age and pose. All that was as new in taxidermy as though, after men had made sounds for generations, it had suddenly been discovered by some bright individual that sounds could be utilized for speech.

To the upholsterer-animal stuffer a deer was a deer, No, it wasn't even that; it was merely an animal, with four feet to be nailed to the mounting board instead of the two



do one thing well

THE "New-Way" could not be sold within anywhere near its price, nor made of as high quality materials and workmanship if our immense factory and skilled corps of workers did not devote their entire time, energy and ability to producing but one type and size engine.

don't be misled

It is the ideal power unit for portable conveyors of all kinds. It delivers dependable power anywhere and everywhere, and in particular, in many places where conveyors cannot be operated by an electric motor. Its use does not depend on the different kinds of electric current as does an electric motor, and it eliminates danger from high current wires. You should order your conveyor "New-Way" equipped.

If *you* have a power problem, let us help you work it out. It incurs no obligation on your part. A letter will bring our traveling engineer to your office.

Write for Circular C-23

THE "NEW-WAY" MOTOR COMPANY
LANSING, MICHIGAN, U.S.A.

Eastern and Export Office
Woolworth Building New York

The Air-Cooled, Multi-Purpose
"New-Way"
5 Engines in 1

Digitized by Google

hich birds had. To this oung enthusiast the particu- r subject was a great deal ore than a mere quadruped, mething more than a deer, ven. It was for example, a oe; a two-year old doe: a wo-year old doe from North- rn Maine; a two-year old, orth Maine doe in the spring f the year. Therefore she ust be mounted with a fawn t her side and the verdure of pring about her, to complete he picture into which she ould fit without doing vio- ence to Nature. Do you see he *art* of taxidermy coming nto being in the thoroughgo- ng brain and under the loving ingers of this lad who had oamed the countryside with is dog, his gun, his eyes and is mind all busy?

While working at Ward's museum in Rochester he managed to complete his schooling —his schooling, not his education—at the State Normal School at Brockport, New York. After four years spent in this way, at the age of twenty-three he went West, figuring there was more game to be hunted and more proud hunters who would want their trophies of the chase mounted than in the East. To go West is of course a purely relative expression. If you are a Bostonian, going to Rochester is going West. If you are an Oregonian traveling to Butte is going East. However, young Akeley went West to Milwaukee and worked in a museum there, far enough away from Ward's to be beyond hurting or being hurt by competition. It was perfectly natural that his notions of animal stuffing and mounting were too newfangled for an established business, so he had to work them out in a shop of his own. The results attracted attention from curators of the really great, non-commercial museums and, after eight years n Milwaukee, the long arm of he British Museum reached out, tapped him on the shoulder and beckoned him to ts service.

Unfortunately for the Brit- sh Museum, the way to Lon- don from Milwaukee lies hrough Chicago, and the raveler has to change cars here, which Akeley did. And not only that, but there were some hours between trains, af- fording the foot of the restless traveler the desire and the time to go somewhat about the city, which Akeley did. And not only these, but Chicago possesses, and possessed then, the Field Columbian Museum. Where else would this particular traveler spend his sightseeing hours than there, among the objects of his life long interest, and among men whose interest was the same? What more natural than to visit with them and, in the course of conversation about this and that, to mention why he happened to be there? And what more inevitably consequently than for those quick-fire Chicagoans to end his journey then and there? They pointed out that there were plenty of specimens awaiting his art and skill, and he could begin being happy right away, without losing a week traveling by train and boat to get to work. Eventually he did reach London, but it was in 1896, as a member of the Field Museum expedition to Africa. On that trip he accompanied the curator. In 1905 he headed the museum's

It will pay you to investigate this



strongest and lightest steel leg platform

CHEAPER BECAUSE IT LASTS!

Combines MAXIMUM STRENGTH with Minimum Weight

Lewis-Shepard Pressed Steel Lift Truck Platforms are reinforced with folds and spot welded. Designed with generous overstrength at no sacrifice of the lightness needed for easy stacking. Furnished complete with all hardwood tops,—but legs sold separate if wanted.

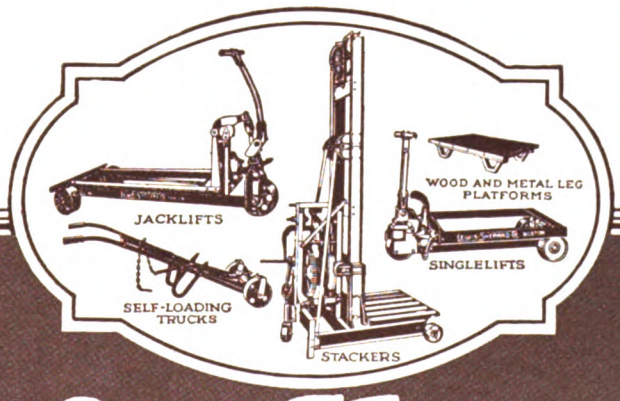
IF YOU Answer this Advertisement

We will send you a book packed full of practical help on the economical handling of materials.

Write us today
at our factory address
582 E. First St.
BOSTON, MASS.

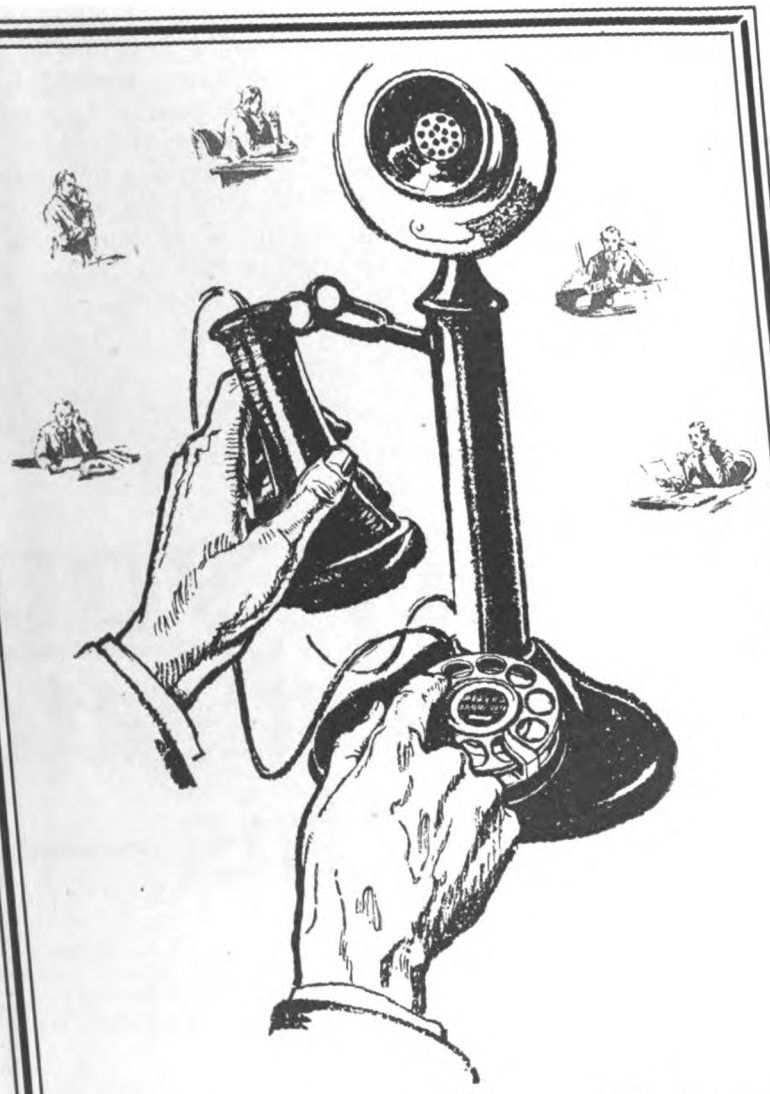
No Advance in Prices

Our volume of business has increased enough so that reduction in overhead practically equals increased cost of material and labor. As long as this condition holds we will continue to sell our full line of Labor Saving Products at *no increase in price to the buyer.*



Lewis-Shepard
BOSTON

Digitized by Google



Turn the Dial and get things done

Your whole organization at your finger tips—Minute meetings at a second's notice—Quick action and co-ordinated effort throughout every department—when you can turn the dial and get things done.

Uncertainties become verified facts—Executive direction is felt in the most remote departments when your organization is connected with

North P.A.X.
PRIVATE AUTOMATIC EXCHANGE

This Private Automatic Exchange is designed primarily to give instant communication within an organization simply by turning the dial. Short distances may cause costly delays. By making it unnecessary to walk to talk North P. A. X. makes it easy to get things done.

In addition to its use for instant interior communication North P. A. X. gives auxiliary service, such as code call systems, conference lines, watchmen's checking service, fire alarms, annunciator service, etc. Everything is automatic—ready day and night.

"Your Whole Organization at Your Finger Tips" is the name of a new bulletin, illustrating the many ways North P. A. X. saves. Glad to send you a copy—and we think you'll be glad to get it. Just say the word.

The
NORTH ELECTRIC
MANUFACTURING COMPANY
GALION, OHIO

In addition to North P. A. X. this company manufactures the most complete line of machine switching equipment for city telephone exchanges. Manufacturers of telephone equipment since 1834.

African expedition and brought home a priceless bag of specimens. Those trips were enlivened by such incidents as fighting and killing a leopard with his bare hands.

During those years his creative genius was given free play, and gradually the revolution of taxidermy from the rag-bag stage into an art progressed step by step. Those steps included not only the posing of the specimen and the reproduction of appropriate scenery, but the equally important and revolutionary displacement of mere stuffing by the mounting of the skin on a light manikin, anatomically and artistically correct, unchangeable in form, and indestructible by decay, moisture or vermin. All this was accomplished not by mere dreaming but by the sweating, dogged plodding which genius alone seems able to endure when, driven by no boss nor by economic necessity, it sets itself to the task of realizing its visions.

During those plodding years Akeley had to make himself an animal sculptor, so as to execute plaster models for his manikins that were not more lay figures to tack the skins upon, but which should have the touch of genius that would impart expression, action, life. And at the same time there was the purely mechanical drudgery, the countless experiments with materials and methods, trying and discarding, one after another, this substance and that, one way of building up a body or fastening sections together, and then another, until at last perfection was achieved. Now, the perfected method begins with the animal in life. Continually photographs are made of the wild animals in their free state, in every procurable act of their lives. These, for the purposes of taxidermy, provide suggestions for the action to be represented by the finished mount and they give the exact relationship of the several parts of the animal's body in the posture in which it is mounted. And, lastly, they picture the natural surroundings of the specimen. The instant an animal is killed, every measurement of the body is made on the spot and carefully noted down. These measurements may run into the scores, and they must be made quickly before there is any distortion by *rigor mortis* or dissolution. Next, the removal of the skin of an animal killed for museum purposes must be done not only at top speed, but also with extreme care to avoid tearing. The task of cleaning an elephant's hide of the bits of flesh which come away with it in the skinning, and which would endanger the pelt by putrefaction, must be given the closest attention, though it may take three or four natives several days to do it. Drying the skin, and packing it for transportation to the shipping point through the humidity and vermin of the tropical jungle or the brittling Arctic frost, demand forethought and resourcefulness in the highest degree. No queen's glove is tanned with the care that is bestowed upon the pelt of a museum specimen by the present-day taxidermist.

Arrived home, Mr. Akeley—no, he is not known as Doctor Akeley—with his photographs and measurements taken in the field, with painstaking care and with sculptural skill that has gained him membership in the National Sculpture Society, proceeds to model in clay each animal whose skin and skeleton have been brought home, in the desired pose. This model represents the skinned body of the animal. A plaster of paris mould is made of the model, the mould of course being a reverse, or negative. Within this mould the manikin is formed, so that the manikin in turn is a positive, an exact replica of the model.

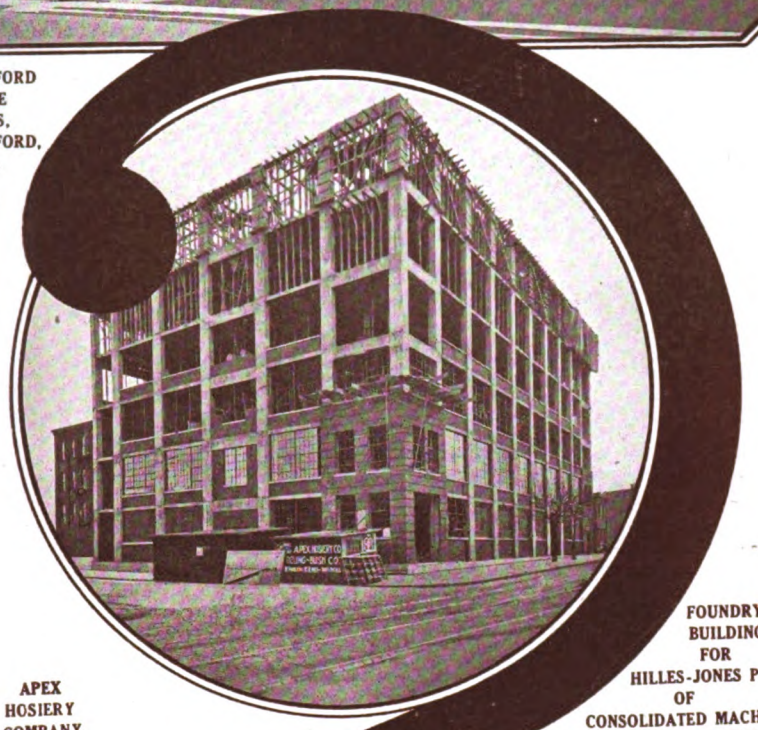
This is the Akeley method of making it. The mould being cut into convenient sections for working, the inside of a given section is first brushed over with a coating of glue. Then a sheet of muslin is laid on and carefully worked and pressed by hand into every undulation of the surface. Next a sheet of wire netting, usually of about 3/32″ mesh, is worked in in the same careful way. The moist papier machè is applied and worked into the meshes so thoroughly as to adhere to the muslin throughout its entire surface, thus binding the muslin and wire mesh firmly together. Another layer of wire mesh and papier machè is added and, according to the size of the animal, still other


ROTHERSFORD NEEDLE WORKS, ROTHERSFORD, PA.

Digitized by Google



OYERSFORD NEEDLE WORKS, OYERSFORD, PA.



APEX HOSIERY COMPANY PHILA., PA.

FOUNDRY BUILDING FOR HILLES-JONES PLANT OF CONSOLIDATED MACHINE TOOL CORP. OF AMERICA WILMINGTON, DEL.



? ? ? ? ?

A POST CARD to us will bring you the information that will satisfy you that our standardized building construction service is a real buy.

Our engineering service is at your disposal and will gladly co-operate with you in the planning and developing of your industrial requirements.

One Organization! One Responsibility!

30-60-90 Day Deliveries

THE BELING-BUSH CO., INC.

Factory Engineers and Builders

THE

Drexel Building **Philadelphia, Pa.**

SERVICE

layers, until the finished shell is from an eighth to a fourth of an inch thick. Thin and light as it is, the strength of the finished manikin is surprising. These, of course, are no slight advantages, particularly with the larger animals, when it comes to shipping or handling them in the museum. The glue being soluble, the section is soaked in water and the shell thus removed from the cast. The several sections of the manikin are fastened together on thin ribs overlapping the joints inside. And last the glass eyes, made with utmost fidelity to nature, are wired in, the skin is glued on, and the long process of procuring and mounting that specimen is completed. As some one has said enthusiastically, the animal now has been made to live forever, for, apart from actual disintegration of the hair and skin through the slow process of mere time, and barring accident, the specimen thus prepared is indestructible.

So much for Carl Akeley, the taxidermist and artist. Now step around to another side of him and consider him as an inventor. In his creation of the art of taxidermy the inventive faculty incidentally served him well. But it is more than sporadic or secondary; it is a coördinate power of a many-sided intellect, supported and made effective by the moral trait of thoroughness and invincibly patient industry.

It will be remembered that the Field Museum was established as a unit of the Chicago World's Fair and that, like all the other exhibits, it was housed in a frame building with an exterior of "staff." The temporary nature of the structure made itself only too plain in a few years by the cracking and falling away of sections of the staff coating, not only giving the building a dilapidated appearance, but letting in the wind and cold and promoting more rapid disintegration of the whole structure. Akeley was familiar, as the whole world was familiar, thanks to the Fair's efficient publicity department, with the then novel method by which the acres of wall space of the Fair buildings had been covered with paint—sprayed on by compressed air. In his

(*Continued on page 57*)



Keep this Watchdog on your Boilers

Your dog keeps away tramps, burglars and thieves from your home—he is your insurance of safety—you feel secure in leaving your home in his care.

What similar kind of safety insurance do you have in your plant boiler room? What protection have you against accidents to your boilers?

This new Powell Valve will give you just that kind of protection.

A New Idea. Nothing like it on the market.

Its automatic *triple action* immediately closes the feed when a tube bursts—isolating the boiler.

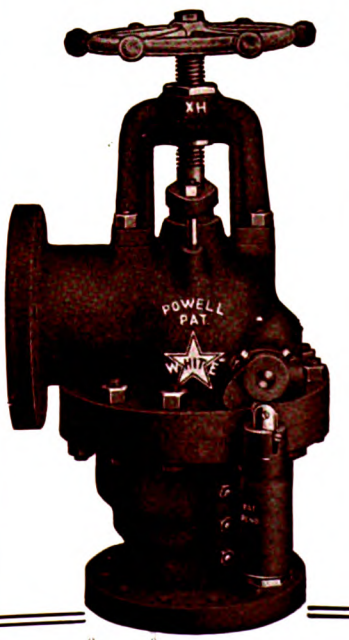
The new Powell Valve is backed by seventy-five years experience— absolutely dependable—vitally necessary to all plants running two boilers or more.

Our new circular tells all about their action which will help you towards greater boiler room efficiency.

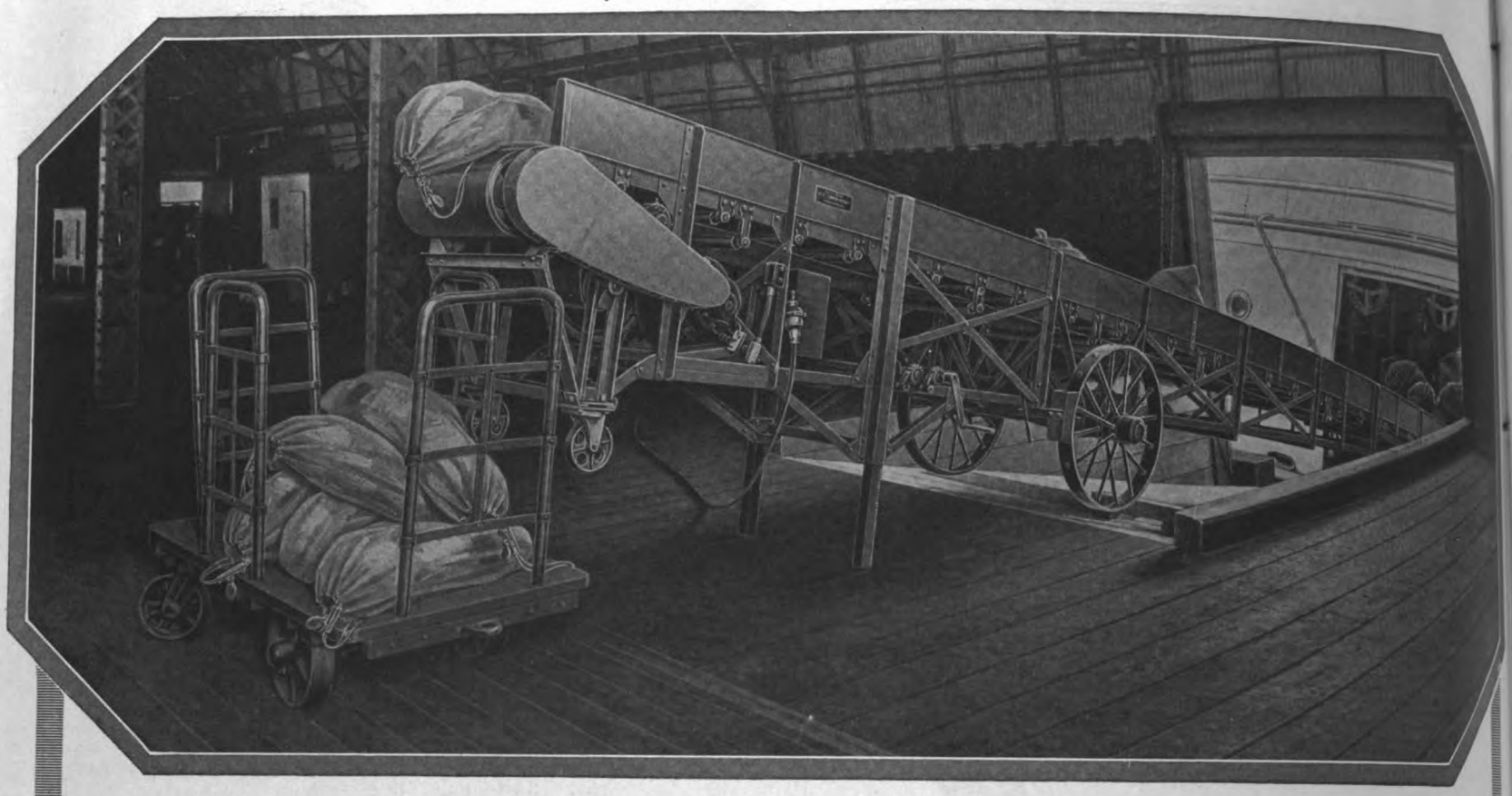
Write for it. It's free.

The Wm. Powell Company

2523 Spring Grove Ave.
Cincinnati, Ohio



Digitized by Google



Have you given the question of Material Handling in your establishment the proper consideration?

It is a big problem worthy of your serious thought because so much depends upon how you handle materials. Take for instance the selling price of your product, if you are a manufacturer. Production without any question determines it. Conveying systems are the means of establishing and controlling production, inasmuch as they keep materials on the move continuously, so that all productive machines and assemblers produce to their utmost capacity.

The cost incident to the receiving and storing of raw materials as well as the shipping of finished product effects the selling price of your product. Rather than the slow moving elevators or trucks requiring attendants, materials can be elevated, distributed and lowered by automatic conveyor units with far greater rapidity at an insignificant cost.

Are you satisfied that your material is being handled properly? Are your operators and assemblers supplied with material? How much time is required to load cars or trucks? How long does it take to unload and distribute a car of raw material? If the remotest doubt exists in your mind allot a few hours to a survey of methods used.

We will gladly have one of our engineers make an analysis of your material handling problem and advise the type of Conveying System which will reduce your handling costs to a minimum.

SAMUEL OLSON & CO.

Loose, Bulk and Packed MATERIAL HANDLING SYSTEMS

2418-26 Bloomingdale Ave.
CHICAGO, ILL.

5th Ave. Bldg.
NEW YORK, N. Y.

Digitized by Google

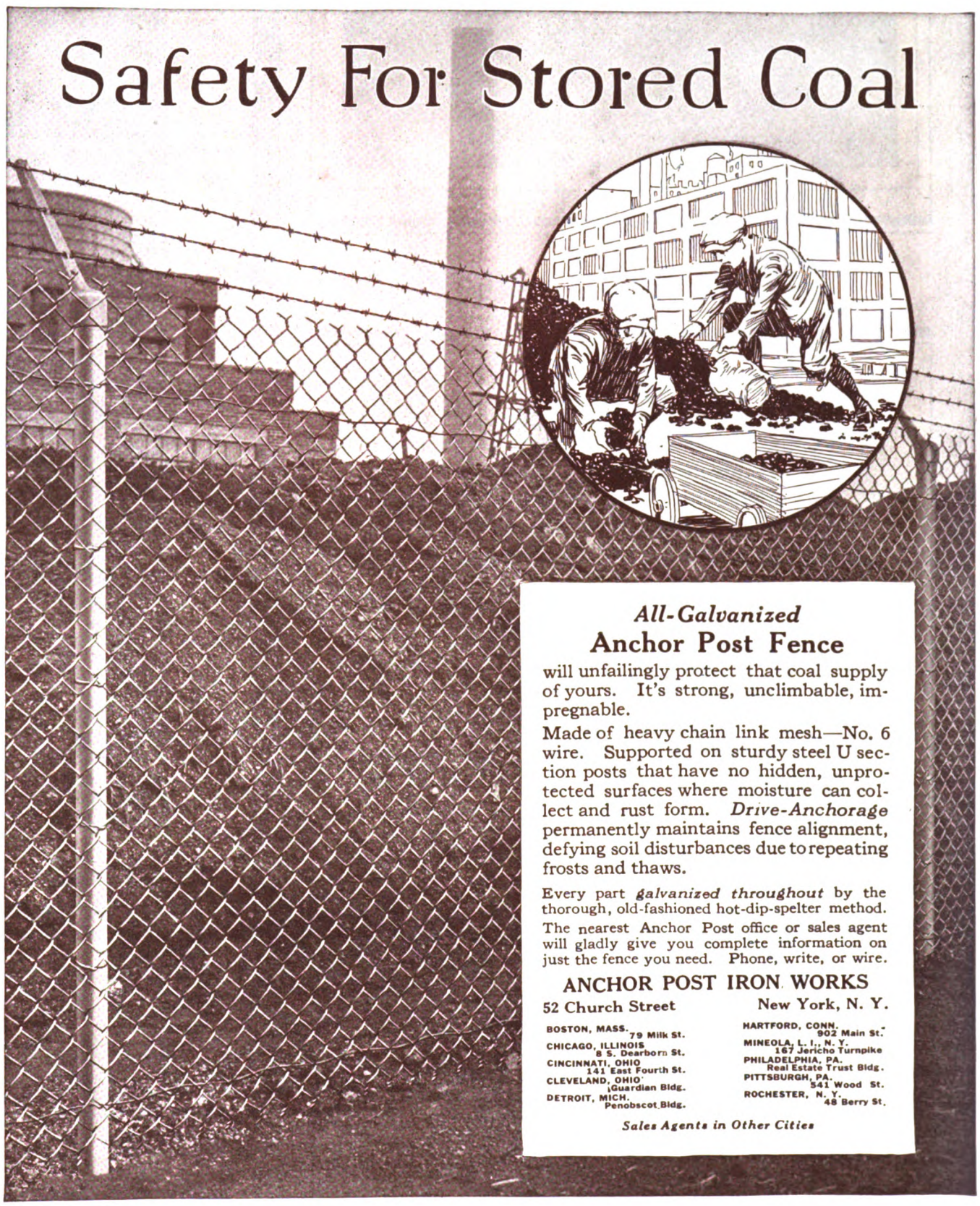
(*Continued from page 55*)

wn work from time to time e had had occasion to apply oatings to his models by the ame spraying method. One ay, as he glanced at the fa- niliar, unsightly, ruinous valls, the thought flashed into is mind: *why* not apply a coat f cement or concrete in the ame way the coat of paint had been put on? He set to work. The thought was brilliant, but he way to materialization of it ay through prosaic toil, end- essly discovering obstacles nd devising ways to overcome hem. Hitherto nothing but iquids had been sprayed. This involved spraying solid naterials. More than that, it necessitated blending them with each other and with water, in accurate proportions, not as a thin liquid, but to a thick, pasty consistency. More- over they must be applied, not in a thin coating on the sur- face to be covered, but to a considerable thickness, and the coat must have body enough to stand up on a vertical surface and not run off by its own weight. Still again, chemical reactions between the materials made them begin to set im- mediately upon mixing, a fact which must be taken advantage of and not permitted to inter- fere with the operation of the apparatus or the physical be- havior of the mixture within the machine or on the surface being treated.

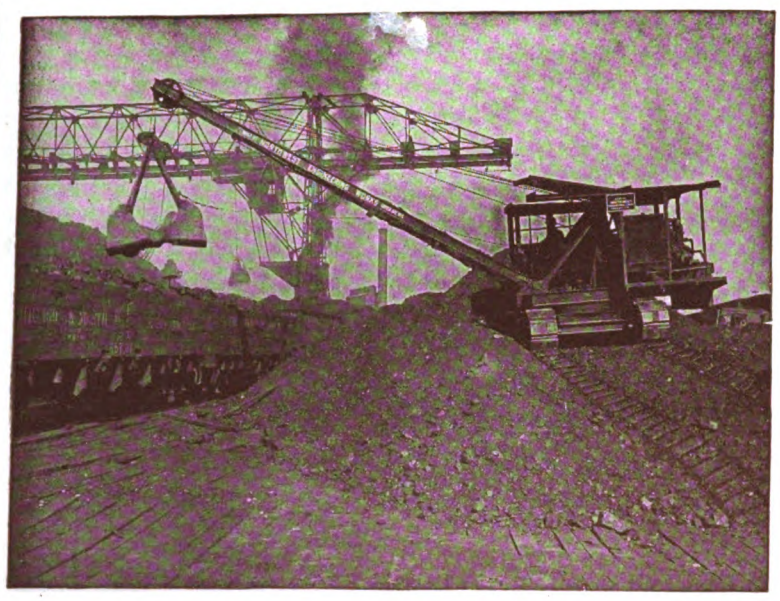
Methodically, one after an- other of the problems were dis- closed, studied, experimented with, solved—and the "cement gun" shot new walls of "gunite" on the Field Museum. The material was christened gunite because, while it consists of the same sand, cement and water as hand-mixed concrete, its pro- portions and consistency are materially different. This is owing to the fact that they they are practically blended at the moment of application to the surface instead of being first mixed and then transport- ed to the point of application. This difference in the time the setting reactions have to ope- rate in, permits a more advan- tageous proportioning of the ingredients which, together with other advantages, gives the finished mass a very con- siderably greater density and strength than concrete mixed in the usual way and applied by trowel or by dumping or pouring into forms. That greater strength cannot be expressed in figures without using a technical table which has no place in this article.

To describe the cement gun in a sentence or two, it con- sists of a tank on two wheels which permit it to be moved about as the work progresses. It has two chambers divided by a horizontal disc wheel whose rim is notched with teeth. The dry sand and cement are mixed and fed into the upper chamber. The revolu- ing disc, or "feed wheel," as its notches pass the opening into the lower chamber, per- mits the mixture to drop in small quantities into the latter. From there small charges are blown by compressed air out through the rubber hose held by the workman. At its nozzle the water is introduced, and the compressed air carries the

(*Continued on page 59*)



Digitized by Google



Climbs with ease

Mobility is one of the paramount reasons for Northwest economy. Ability to climb up over piles, in and out of the rough and irregular places and handle material from practically any angle speeds up operation and reduces costs.

This is accomplished by means of the famous Northwest Crawler Base—a Northwest steers like a truck—and is as easily handled.

High flexibility of power, simplification of mechanism and control make it a popular machine with every man that has used it—there are no fires to pull, no dials to watch—it is always ready to run and it always runs when the operator is ready.

Let us tell you what they are doing now —and what they will do for you.

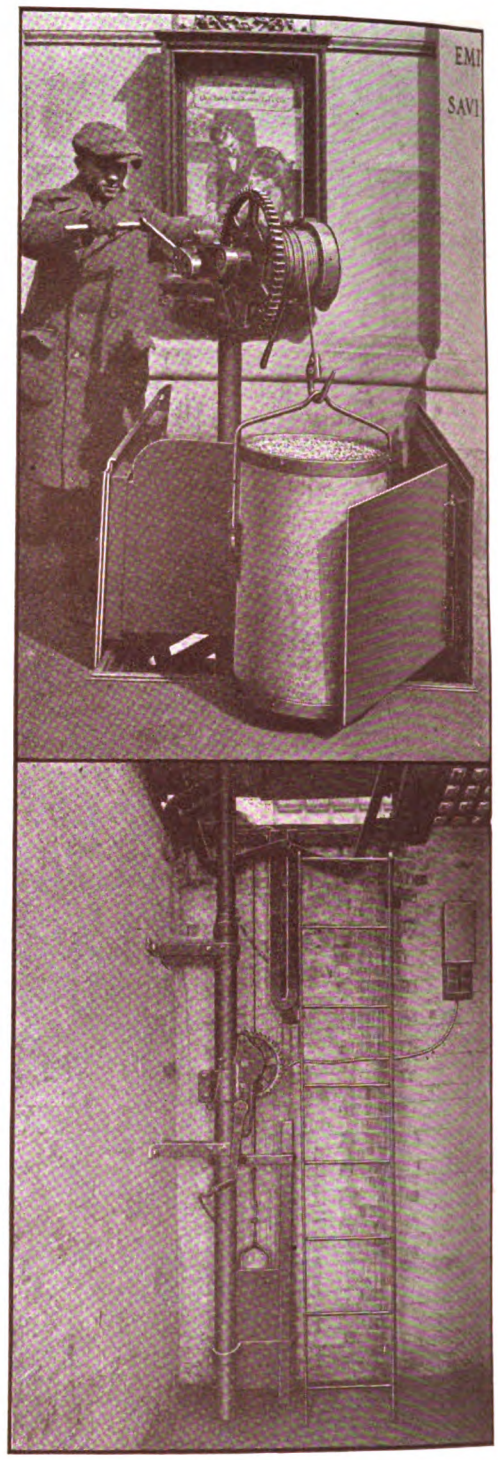
Write for the complete story.

NORTHWEST ENGINEERING CO.,

1231 Steger Bldg., Chicago

NORTHWEST

CRANE
DRAGLINE
SHOVEL



Easily operated by One Man

THE G & G Model A Telescopic Hoist illustrated is particularly adapted to the removal of ashes from moderate sized buildings. Also used inside factories and warehouses for handling loads under 1000 lbs. For handling a heavy volume of ashes our electrically operated Hoists are recommended. Get the complete story of this time and labor saving equipment.

Write for booklet "Industrial Plants Need This Hoist."

GILLIS & GEOGHEGAN

556 West Broadway New York City

the

G&G

REG. U.S. PAT. OFF.

Telescopic Hoist

with Automatic Gear Shifting Brake Device and Silencer

Digitized by Google

(*Continued from page 57*)

completed mixture in the form of "spray" to the surface which is being coated.

An almost endless list could be given of the uses to which the cement gun already has been put since it was introduced to the public at the 1910 Cement Show in New York. In the great majority of cases a wire screen is set one-quarter of an inch or so away from the surface coated, the distance and also the weight and mesh of the wire screen or metal lath being governed by the thickness of the concrete coating. One of the great savings accomplished by the cement gun, besides time, is elimination of lumber forms. This has made possible some uses of concrete which previously were impossible or so difficult or expensive as to be impracticable. Among them is that strange thing to the lay mind, the concrete ship. Another is in mines, where it shoots heavy reinforcements of gunite which hold up crumbling walls and roofs where it was impossible to apply the necessary thickness of concrete and give it the adhesion required, with a trowel or by means of forms. Old houses, new factories, California villas, are covered, over the old wooden framing or the new steel skeleton, with concrete that is not only as durable as the Pyramids but beautiful in texture and color, when those effects are desired. In the industries it is used, among innumerable other ways, to line furnaces, kilns and cupolas far more quickly, and often more durably than can be done with brick. In marine engineering, piers and piling, seawalls and linings of canals and basins, are built up and repaired with this device and the material which is its working mate.

We are not through with Carl Akeley's major inventions. He was among the first to take a motion picture camera into the field of game hunting, because he wanted to get the largest possible number of true pictures of the postures of his subjects for preservation in permanent form. He soon found that the instrument which had been perfected for the studio had very distinct limitations under the rough-and-ready hazards of a faunal expedition in the wild corners of the earth and in the climates there encountered. "There was no movie director," says Mr. Akeley, "to tell my untutored animal actors where to move in order to keep within the field of my camera lens, so they were apt, very often, to jump clear out of the picture at its most interesting moment. If one of my carrier-boys stumbled and dropped the machine into the river, or on a rock, it came to more or less grief, or the contained film did." The long and short of it was that again Akeley's inventive mind did not stop with cursing the short-comings of the instrument provided by others but proceeded, through some years of labor, to develop what he needed. The result was the Akeley camera which now accompanies practically every scientific expedition, whatever its purposes, wherever its destination, if photographing is among its activities.

What had to be done, to meet the requirements of scientific field work with the motion picture camera, presented a rather formidable array of problems. The Akeley camera does them all. An animal or bird cannot, except at extraordinary and never attained speed, jump or fly out of the plane of rotation in which the camera is swinging to follow its movements, as it easily can in the case of the studio camera because, in the latter, rotation in the horizontal and vertical planes is accomplished independently, and by cranking. The operator of the Akeley camera keeps it pointed at the moving subject, without cranking at all, but by the simple, natural grasp of his left hand on the single "stick" with which he not only moves the camera readily in every direction, but does it so smoothly that the picture is never jerky.

As he thus moves the camera about, the operator does not have to stoop and stretch to keep his eye to the eye-piece He follows it only in its sidewise motion; the vertical motion takes care of itself. He changes his lenses in two or three seconds from the shortest focal length to the longest telephoto. He loads and unloads the film in daylight, losing only the single inch exposed at the moment. This





Digitized by Google

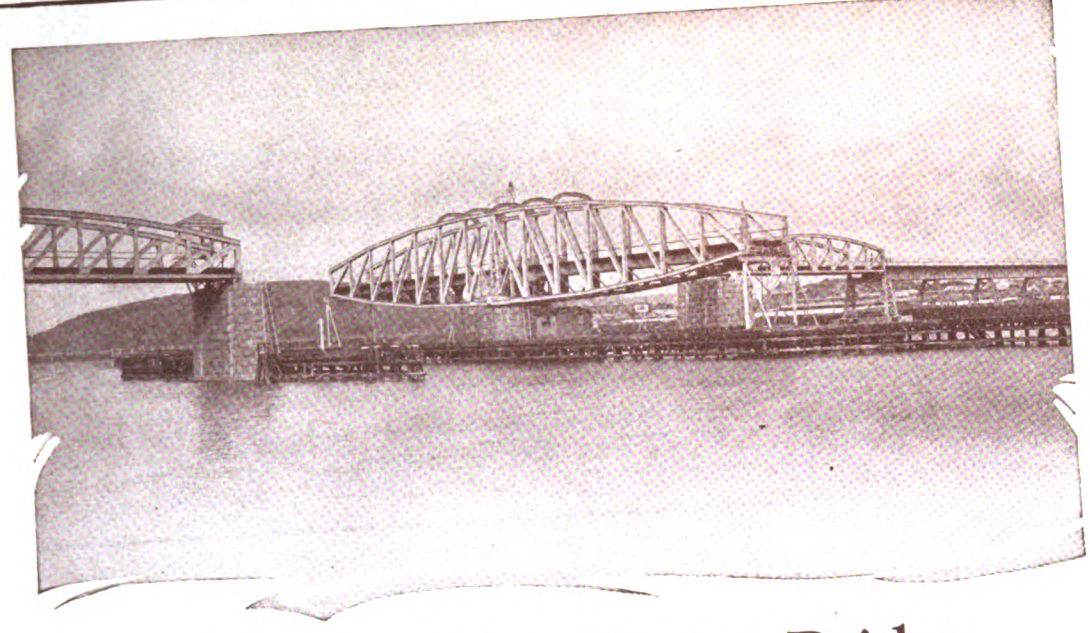
feature, since the amount of unused film is registered, enables him to use up his short ends on short pictures—an advantage not to be despised when one is leagues and weeks away from the nearest supply house. All metal, it has proved its unbreakability by surviving an airplane crash and then being picked up by the operator and used to shoot a picture of the wreck, as if nothing had happened, so far as itself was concerned. And it isn't smashed by the charge of a wild animal who knocks it over, which means that the dare-devil cameraman can grind it an instant and a half longer, and get that much more of the most thrilling movement of his picture, than if he had not only to run himself at the last eyeflicker moment, but also to get his machine out of harm's way lest he lose the whole of his work!

It is only a one-man pack. That, again, means it can be brought into almost instant action when an unexpected opportunity for a picture presents itself; there is no time lost in assembling separated parts. Water-tight and moisture-proof—that qualification, by the way, to the astonishment, perhaps, of some of us uninitiated, arm-chair and movie-show explorers, is demonstrated best, not in the steaming tropical jungle, but in the frozen North, if you please! Hear Robert Flaherty, who filmed "Nanook" in the Hudson Bay country, tell how, during a fifty-five days' journey, "the cameras had to be taken into the igloos at night, a procedure which caused them to rime up, all of which meant that once during every day of the journey they were thoroughly wet with moisture. If you were to examine the cameras today, I am sure you could not determine which one of them underwent this journey."

So the Akeley camera roams the face of the earth in its remotest corners, it soars the sky in airplanes. It follows the racing, milling players in the football games so that at the class meets of fifty years hence the players and their sons and their grandsons can raise the roof with a repetition of the cheering on the great day.

And its inventor works in a still, out-of-the way corner of the American Natural History Museum facing Central Park, back of a great family group of elephants mounted as man never mounted animals until this man did it. For its manufacture a corporation was formed, as was another to make and market the cement gun. So this one man has created an art, and he has created two new industries, where there was none before. Is it any wonder, therefore, that in his desk there reposes the great bronze medal awarded to him on October 18, 1916, by the Franklin Institute of Philadelphia "for his cement gun" since John Scott in his will directed that the medal should be given from time to time to "ingenious men and women who make useful inventions"?

SKF



Weight of Huge Swing Bridge
Supported on a Single Ball Bearing

THE pivot of this huge swing bridge which supports the weight of the span, is carried on a single SKF marked thrust ball bearing. Despite the heavy weight supported, the bridge is positive in its action for it is supported on chrome steel balls poised ready to roll between hardened races of steel. Similarly the driving mechanism is reliable in its action for it, too, is ball bearing equipped.

This installation typifies the wide adaptibility of ball bearings which are in extensive use on machines varying in nature from small high-speed instruments of precision to powerful electric generating units, car-wheel lathes, mining locomotives, propeller shafts of ships, coal driers, paper making and stone-cutting machinery, etc.

Wherever used ball bearings defeat friction which extracts its heavy toll in power loss, heat, wear, destruction and uncertainty of performance. It is because of the widely recognized superiority of ball bearings that they have met with such extensive, diversified application.

THE SKAYEF BALL BEARING COMPANY
Supervised by SKF INDUSTRIES, INC., 165 Broadway, New York City

945



Normal View

Deflected View

BALL BEARINGS
The Highest Expression of the Bearing Principle

Digitized by Google

Magnetism and Magnetic Separators

(*Continued from page 9*)

2nd—Magnetic concentration.

3rd—The removal of minute particles of iron from a finished product.

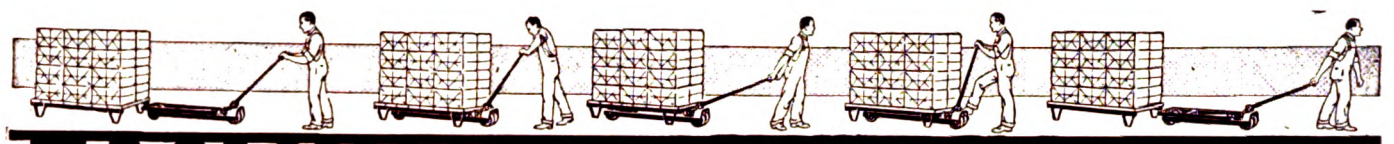
Under the first classification perhaps the simplest type is what is known as the magnetic pulley, which is built up of steel plates between which are coils connected in series. Through these, current is passed and the result is that one steel plate becomes a north pole and the next one a south pole and so on. The distance plates between these poles are of non-magnetic material, usually bronze. The wires conducting the electricity into the interior coils pass through the hollow shaft and terminate each on a slip ring upon which contact is provided through an ordinary carbon brush the magnetic pulley acts as the head drive pulley on a conveyor belt of the usual types used. The material to be separated, when it reaches the magnetic pulley is acted upon by the magnetic flux emanating from the pole pieces and those parts attached are firmly drawn downwards and cling to the belt until deflected underneath the pulley and away from the natural point of discharge.

What is commonly called "tramp iron" consisting of nails, nuts, bolts, mule shoes, drill points, etc., is the crusher's greatest enemy. Even though constructed of alloyed metals offering extreme resistance to breakage, iron, when mixed with material to be crushed always causes shutdowns and oftentimes total wrecking of the crusher. Wherever therefore, crushing is done and foreign iron, so plentiful everywhere, finds its way into the material, it must be removed. Disastrous explosion and fires resulting from sparks in high speed machinery, are avoided by eliminating the iron before the material reaches the crusher.

Tramp iron will find its way into the material to be crushed. A car of coal when loaded at the mine may have stray pieces of iron on the floor, bolts, nuts and washers in the car may shake loose enroute, and the coal itself before it has been loaded into the car may contain steel drill points, railway spikes, mule shoes and sledge hammer heads, all carelessly strewn about the mine, let alone the many loose iron parts of a car which fall off at its destination when the car in its entirety is probably dumped by turning it up-side-down.

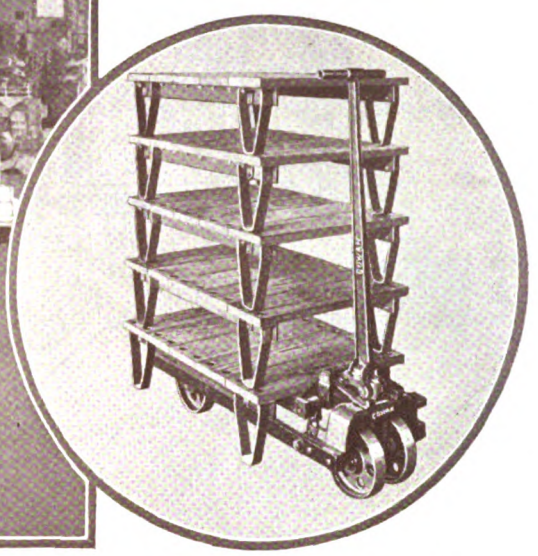
Unscrupulous dealers in junk bone, because iron is cheaper than bone, "salt" their shipments. The same procedure is practiced by some exporters of merchandise, much iron, consigned as "cocoa beans," "tobacco," "roots" and "herbs" is ex-

(*Continued on page 63*)



ELIMINATE REHANDLING





Cowan Hand Lift Truck and skid platforms in the drill press department of a large manufacturing plant. Rehandling of incoming and outgoing materials is entirely eliminated.

Cowan Hand Lift Truck and Skid Platforms



Here, stored skins are quickly and easily moved by the Cowan System without rehandling.



Manual handling of these heavy loads would be slow, costly work. Quick, easy work here.



Through the Cowan System, even a girl can move loads weighing several thousand pounds.

This System has reduced material handling costs for thousands

In shop, warehouse, and factory—in businesses covering a range too wide for simple classification—the Cowan Hand Lift Truck and Skid System has effected remarkable material handling economies.

So broad has been the application of the Cowan System that it is quite probable that you, too, could save many thousands of dollars per year through adapting it to your own needs.

Why not see for yourself how the Cowan System has reduced handling costs in your particular line of business? Just write, briefly describing the goods or materials you handle, and we'll gladly send you information pertinent to your own problem.

COWAN TRUCK CO., 6 WATER ST., HOLYOKE, MASS.

Representatives in New York, Chicago, and other Principal Cities.

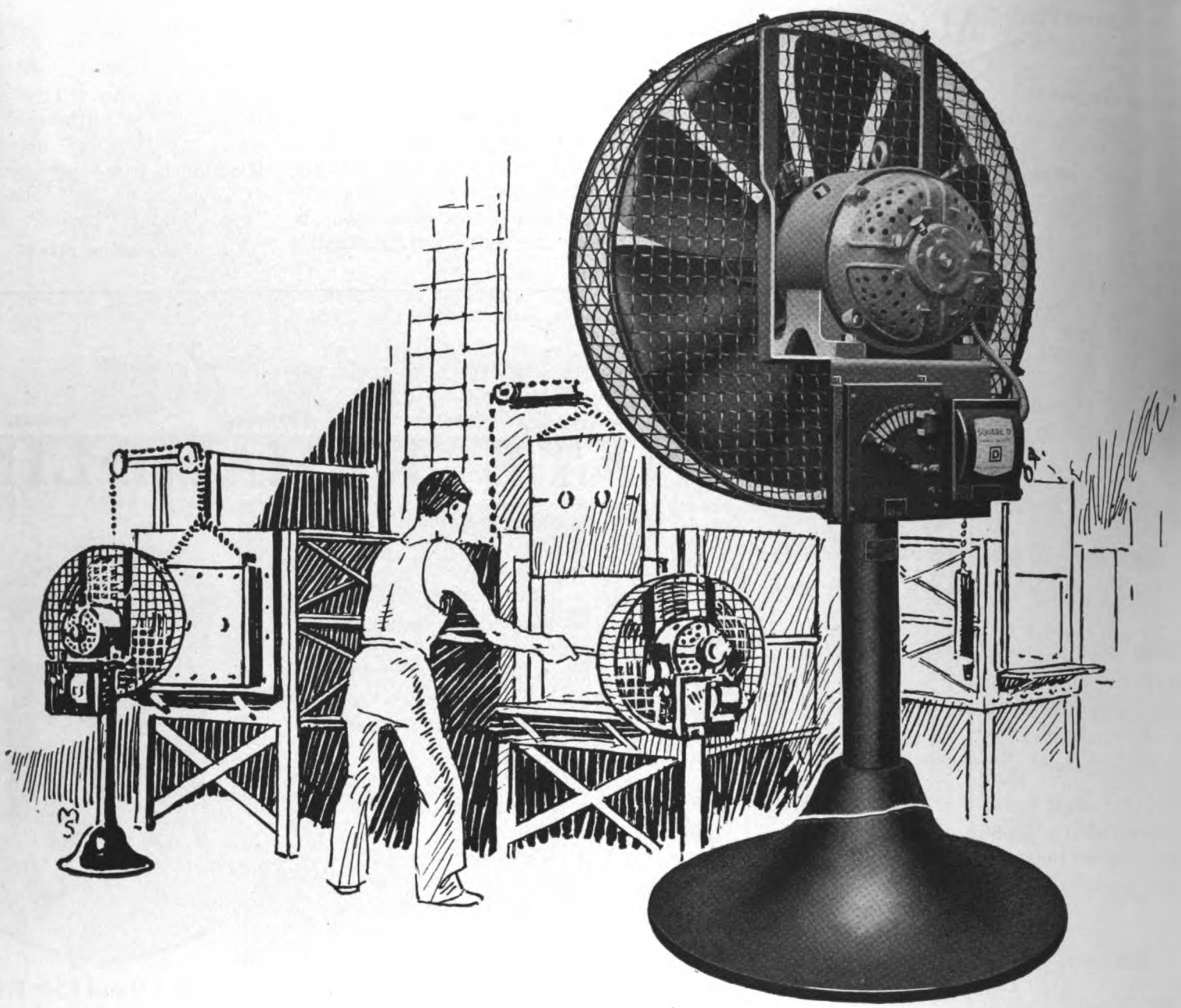
Largest Manufacturers of Complete Hand and Electric Industrial Truck Systems.

2068-N

COWAN INDUSTRIAL TRUCKS-TRACTORS



Digitized by Google



Lower Your Labor Turnover on the "Man-Killing" Jobs

At the forges or the heat-treat furnaces, in the boiler room,—wherever men sweat, and swelter and "slow-up" long before the day is done:—there is where American Blower Man Cooling Fans pay big dividends.

They fan these burning places with currents of cool, fresh air. Men do more and better work and stay on the job because they work in comparative comfort. Production costs drop and so does labor turnover.

Man Cooling Fans can be set anywhere and the breeze controlled at will. Write for details and learn how many big concerns have found them to be both profitable and humane investments.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO (294)

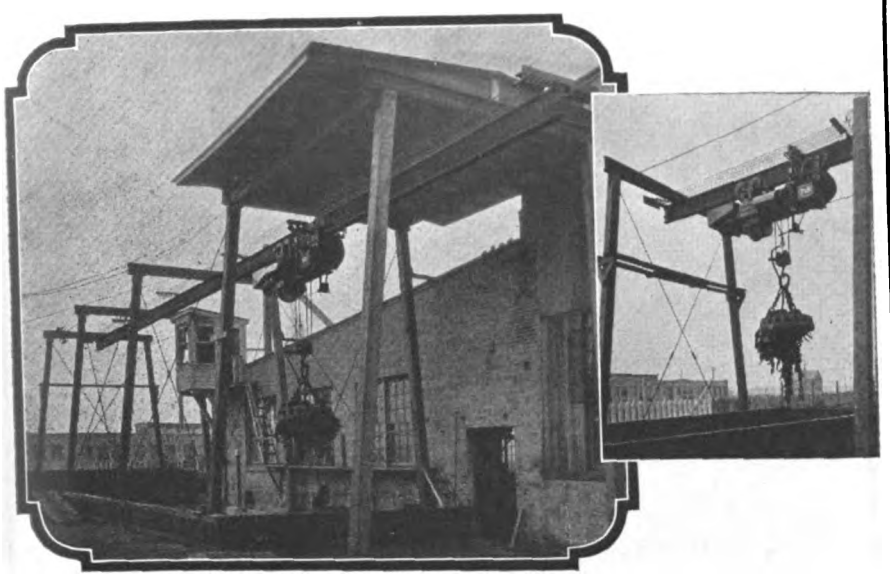
American Blower

"Sirocco" TRADE MARK

EXHAUSTERS · VENTILATING FANS · AIR WASHERS · BLOWERS · ENGINES

FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

Digitized by Google



Caring for Scrap Is Economy

But Carry This Economy Further— Use Economical Handling Equipment

As the Michigan Manufacturer says: "Avoidable waste in America's industry is being gradually eliminated, millions of dollars are being saved, which a few years ago represented mountains of scrap. Scrap is being collected regularly,—stored, and shipped."

To get the greatest return out of this economical habit, —nothing should be wasted through expensive handling methods. P & H Hoists have proven big factors in reducing labor costs.

12 Men Released for Other Work

In one plant, a P & H 3-Ton Hoist does the work of loading cars with miscellaneous scrap, that formerly required 12 men with wheelbarrows. The loading of 50-Ton cars which took 5 hours with these 12 men, now takes but 2 hours and only the hoist operator is required.

Unloading is of course done with this same hoist,—100 tons of steel plate are also unloaded in 4 to 5 hours—work that took all day and a gang of 12 to 15 men.

P & H Hoists can be installed inside or out. They may be put up in existing buildings, even where headroom prohibits the use of traveling cranes. They may also be used as feeders for cranes. They conserve floor aisle area by using overhead space otherwise not used, their service in expediting the handling of materials used in production, being of still more value than in scrap handling.

Crane and Hoist Division

PAWLING & HARNISCHFEGER CO.

Established in 1884

3850 National Ave., Milwaukee, Wis.

New York	Atlanta	Chicago	San Francisco
Pittsburgh	Portland	Philadelphia	Birmingham
Phoenix	Denver	Los Angeles	New Orleans
Seattle	St. Louis		

P&H HOISTS

(*Continued from page 61*)

tracted in this way.

It may interest the reader at this point to know in what industries the magnetic pulley has found application, and a few are enumerated:—

In the crushing of coal for strokers or powdered fuel, slag for ballast and concrete, salt, ore, glass cullet, abrasives, clay, etc., from which the tramp iron must be extracted to protect the crusher. Then again, the finer grinding of such materials as fertilizer, cocoa beans, sugar, talcum powder, grains and feeds, drugs and chemicals, carbon, rubber, etc., involves magnetic separation to protect the high speed grinders there employed.

Many pocket-knives, miners, lamps and similar pieces have been restored to their owners as has also an occasional can of beans or sardines which, during lunch time were set aside and overlooked, and which again appeared later on among extracted iron.

Under the second classification, magnetic concentration, magnetic separators find their greatest application in the concentration of magnetic iron ores which are scattered promiscuously and in great abundance in all parts of the world. The iron ore may exist as a highly magnetic ore, magnetite or as some of the higher oxides such as limonites and hematites. In the concentration of the former, a magnetic separator of medium intensity is employed, while in the case of the latter a more powerful high intensity separator is used.

Minerals always are associated with quartz, rock and silica. The latter are non-magnetic, and the preparation for the separator consists merely of crushing the ore as mined so that the iron and its non-magnetic associated gangue are more or less mechanically free from each other. The Magnetic Separator then extracts the magnetic portion, iron, and permits the non-magnetic portion, gangue, to pass on unaffected.

Magnetic separators for concentration may be of the dry or wet type. The former is employed when the ore does not require fine grinding. The latter is employed where fine grinding is necessary. The

(*Continued on page 65*)

Packed with Power for Production!

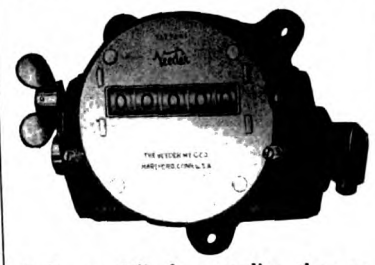
A Veeder Counter means more power to your machine—more pep to your machine operator—because those things "register" with you!

They register on the dial of a Veeder Counter, thru the obvious necessity of the operator making a *good* record; one that justifies good pay.

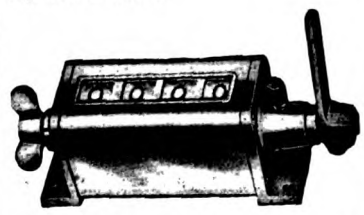
Work *moves* at the counter-equipped machine as it never moved before, because work and *production alone* moves the figures of the

Veeder COUNTER

Here's the big new development in a Punch Press Counter; a heavy-cased ratchet mechanism, immensely durable:



Built especially for recording the product of punch presses, metal stamping machines and other heavy-duty machinery. Strong stops limit the movement of the lever to 45 degrees or ⅛ turn, which registers one on the dial. The large, legible figures are easily read ten feet away. Counter is regularly furnished with five figure-wheels, and may be *set back to zero* by one turn of knob. Requires no special fixtures for attaching. Price $18.00.



The Revolution Set-Back Counter above records the output of any machine where a shaft-revolution indicates an operation.

Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figure-wheels, as illustrated, $10.00—subject to discount. *Cut less than one-half size.* Set-Back Rotary Ratchet Counter, to record reciprocating movements as on presses, $11.50 (list)

FREE—This new 80-page booklet shows everything you could ask in a counter. Ask for Copy.



The Veeder Mfg. Co.

63 Sargeant St. Hartford, Conn.

Digitized by Google

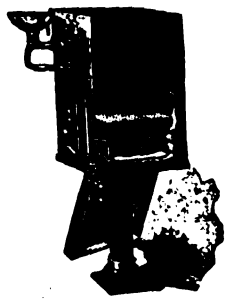


Does this happen in your plant?

THREE or four minutes wasted waiting for the water to get cold may not seem like a big item in itself. Its worst effect is that it presents an excellent excuse for loitering; so that these three or four minutes quickly multiply themselves into a cumulative loss that mounts into many dollars yearly.

Jewett *Square* Water Coolers not only obviate this time waste—but when installed in connection with the regular water system, hygienically provide an ample supply of refreshing, cooled drinking water that counteracts the tiring effect of hot weather, energizes your workers and definitely stimulates production.

Literature covering the economy of Jewett square design in detail—as well as the convenient, sanitary angle-flow bubbler and many other advantages—will gladly be mailed, together with prices upon request.



Uses 25% less ice

The Jewett Refrigerator Company
Established 1849
36 Chandler Street, Buffalo, N.Y.

JEWETT
SQUARE WATER COOLER



The fireproof, sanitary Marbleloid Floor of the Cafeteria of Studebaker Corporation at South Bend, Indiana.

THIS FLOORING USED EXTENSIVELY IN INDUSTRIAL BUILDINGS

Marbleloid is a fireproof, resilient, non-abrasive, non-slipping composition flooring material which does not require expensive upkeep and can be laid upon old or new wood or concrete floors. It is laid plastic and sets in a few hours into a seamless, smooth surfaced floor, good for a lifetime of service.

We have made a large number of installations of **Marbleloid Floors** in the offices, laboratories, hospitals, and restaurants, cafeterias, welfare rooms, work rooms, toilet and locker rooms, display rooms, etc., of industrial plants.

Marbleloid Flooring is manufactured and installed by our organization and guaranteed by us.

MARBLELOID
The Universal FLOORING for Modern Buildings

The coupon below will bring you additional facts- **without obligation.**

THE MARBLELOID CO., 467 Eighth Ave., New York

THE MARBLELOID COMPANY, New York City: Without obligating myself in any way, please submit tentative estimates on the cost of your product installed complete for our building..... .....; below are the approximate areas involved.
Floor.....Sq. Ft. Sanitary Base.....Lineal Ft.
Wainscot.....Sq. Ft. I have checked the floor troubles we now have.

Our floors are
☐ New Concrete ☐ Cement Finish ☐ Wood
☐ Cracking ☐ Cold ☐ Slippery
☐ Dusting ☐ Splintering ☐ Unsanitary
☐ Noisy ☐ Rough ☐ Rotting

Name .....
Firm .....
Address.....
☐ Please send 32-page Illustrated Booklet

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Control



The SIX SENSES
Seeing
Feeling
Hearing
Smelling
√Tasting
and
Tycos
Temperature
Control

If Sense of "taste" sufficed the canning industry!

IF the fitness of cooked foods—its readiness for canning—were gauged simply by its taste, then ptomaine poisoning would be a scourge of the human race instead of a rare occurrence. The essence of successful food preservation is perfect cooking, to render the foods sterile, to kill the bacteria which cause decomposition. The essence of successful food sterilization is the accurate indicating, recording and controlling of temperatures. There is a well defined temperature point at which food should be sterilized to insure the bacteria being killed. This cannot be told by the sense of taste or sight or any of the familiar senses, but it can be, and is, absolutely assured by the "sixth sense" of industry—Temperature Control—made possible by *Tycos* Instruments.

Food in cans is sterilized by being heated by steam in pressure chambers. The canner cannot depend on the usual senses for knowledge that the contents have reached and are being held at the right temperature. Again the "sixth sense"—again the temperature control, made possible by *Tycos* Instruments, plays its part.

It is a tribute to the accuracy of *Tycos* Temperature Indicating, Recording and Controlling Instruments that the use of successfully canned goods is world wide today. It is significant that *Tycos* Instruments are regarded as the standard of accuracy in big canneries everywhere.

Is your business—your industry equipped with the "sixth sense" Certainly among the more than 8,000 different types of instruments in the *Tycos* Line are the ones exactly suited to your needs. *Tycos* Engineers are prepared to advise you in their installation. Literature on any type in which you are interested will be sent upon request.

Tycos in the Home

Tycos Wall Thermometers To help you maintain a temperature in your house conducive to good health.

Tycos Bath Thermometers To enable you to get the most good from your bath.

Tycos Hygrometer To enable you to keep the humidity of the atmosphere in your home correct at all times.

Tycos Stormoguide Forecasts the weather twenty-four hours ahead with dependable accuracy.

Tycos Quality Compasses To show you the right way in unfamiliar country.

Tycos Home Set Bake Oven Thermometer, Candy Theremometer, Sugar Meter. The secret of accurate results in cooking.

Tycos Office Thermometers An aid in promoting human efficiency.

Tycos Fever Thermometers A necessity in every home.

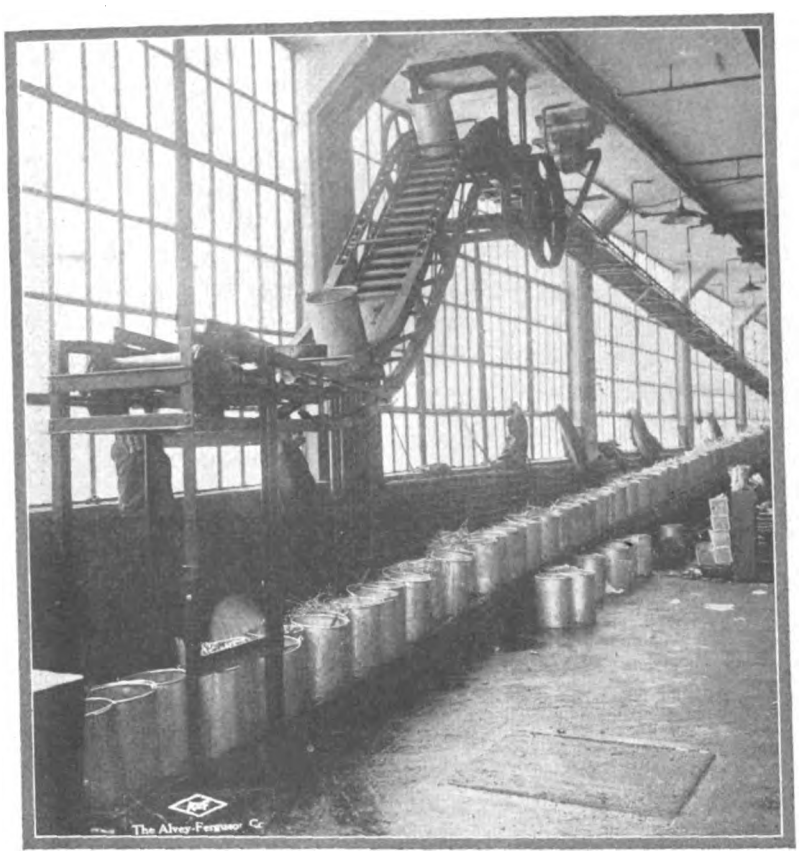
Your dealer will show them to you. Ask us, on a postal, for booklets on any of the above.



Taylor Instrument Companies
Main Office and Factory
Rochester, N. Y., U.S.A.
Canadian Plant
Tycos Building
Toronto, Canada

Tycos Temperature Instruments
INDICATING · RECORDING CONTROLLING

Digitized by Google



How Continental Motors handle scrap steel at low cost

In the Continental Motors Corporation plant, scrap and turnings ride from the machines to the dumping tank and empty cans ride back on Alvey-Ferguson Gravity Conveyors. The transfer is made on an Alvey-Ferguson Automatic Inclined Elevator which boosts the cans to the overhead return gravity conveyor. And the only power required is a small motor which operates the lift. This system replaces a gang of truckers and uses less than half the floor space.

CONVEYING MACHINERY A-F

Conveyors

Aren't there many places in your plant where some such conveying system would speed up production and simplify traffic? No matter how different your plant may be, you can use Alvey-Ferguson Conveyors on every handling job at a substantial saving over hand trucking. Where standard machines are not practical, our Engineering Department will develop a special conveying system to suit your needs. We will gladly figure on the saving Alvey-Ferguson conveyors can make in your plant—at no obligation to you. Write us today.

Alvey-Ferguson Company, Inc.
Cincinnati · Ohio

(*Continued from page 63*)

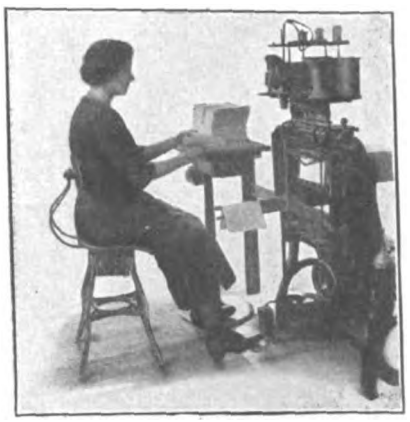
water assists the separator to overcome entanglement which may be promoted by the rush of the magnetic portion to the magnet.

In the zinc industry, where zinc sulphide and iron sulphide together are usually found associated with quartz and rock, and where neither the zinc sulphide, quartz and iron sulphide is magnetic, the last-named is made magnetic by subjecting it to an oxidizing roast. This roast does not affect the zinc sulphide or the quartz. The roasted ore is then passed through a separator which removes the roasted iron sulphide and allows the zinc and quartz to pass along unaffected. Further concentration by specific gravity methods (and which heretofore was not possible because the zinc sulphide and the iron sulphide approximated the same specific gravity) is now readily accomplished.

In every-day machine shop practice, brass, bronze or aluminum borings are produced. A bronze boring may have an outer casing of steel or iron, and in the process of machining the bronze and iron borings become intimately mixed. Bits of tools are broken off or worn off which also find their way into the borings, and these non-ferrous borings before re-melting and making into new castings, must have all the iron removed, otherwise small modules of iron will form in the casting and play havoc with the tools when the casting is machined. The machine most commonly employed and which will produce an iron-free non-ferrous boring and a clean bronze or brass free-iron product is what is known as the disc type separator. Here the mixed borings are fed into a hopper which insures an even feed upon an inclined shaker which passes beneath a magnet whose two pole pieces conform to the area of a circle.

A revolving disc of non-magnetic material, excepting the projecting lugs clearly shown, serves to deflect the magnetic particles in the borings when, in coming in close proximity to the large magnet are lifted upward. Two magnetic zones with the above construction are possible, so that a particle of

UHL STEEL PosturChairs



The illustration shows seat tilted forward which brings the back with it. Note the straight line spine and the properly located back support.

This bindery operator is scientifically seated upon a Uhl Steel PosturChair, which increases her production, furnishes comfort during the entire day. And, her body is in the position health demands it should be.



The Uhl Steel PosturChair fits the body. The seated skeleton shows correct support. Note how the pelvic bones are relieved by the seat shape.

Fatigue is the thief of production. Incorrect support of the body breeds poor health. No employer would knowingly sanction impairment of health resulting from wrong chairs. And, increased production is being sought by every means. The Uhl Steel PosturChair is the answer.

PosturChairs have been designed in conjunction with, and are approved by the American Posture League of New York. Each chair bears label of approvel.

SPECIAL FEATURES: Made of cold rolled steel except seat and back which are wood. 10 heights each with 3" height adustment. Seat tilts forward or backward. Swivel seats when wanted. Durably built, neatly finished.



This is the No. 8150-V-WB, 28" high adjustable to 31". Nine other sizes. Note shape of seat. Sit in it and be convinced.

TRY ONE AT OUR RISK

If you are seeking more production and greater health protection for your workers, write us for a sample to try under your own conditions. It's free for two weeks use. Mention height needed. Descriptive pamphlets available.

THE TOLEDO METAL FURNITURE CO.
1606 Hastings St., Toledo, O.
Manufacturers of steel equipment for factories, stores, offices and schools.

Digitized by Google



Suppose

You fire an employee — would his work be authentically recorded or counted—could you pay him off ?

If you had

ROOT COUNTERS

ingeniously installed you could. They are the most versatile and dependable little helpers you can have around your plant.

We will gladly give you the benefit of our experience as to the best application in your shop.

We find new useful uses every day.

What would YOU like to KNOW?

ROOT
BRISTOL, CONN.

iron which passed through the first is surely gotten by the second. The shaking and tumbling effect on the material when it travels down the shaker, insures a thorough disentanglement of the mixture.

In grey iron, steel or malleable foundries, there is a tremendous waste of iron going out to the dump, unless a magnetic separator is employed to reclaim this iron. For this purpose a revolving screen with a magnet at its lower end is used. The refuse consisting of sand, brick-bats, burnt cores, spillings, gaggers, risers, etc., is first screened and the sand so obtained is fit for re-use. The pieces of iron with the coarser value, less material, travels to the lower end of the screen where it comes in contact with a magnet of semi-circular shape and this attracts the iron firmly to it, and by virtue of the revolving of the screen carries this iron upward and around until it is automatically carried outside the influence of the magnet where it drops into a chute to collect it. The valueless material which has reached the end of the screen with the iron takes its natural course for discharge.

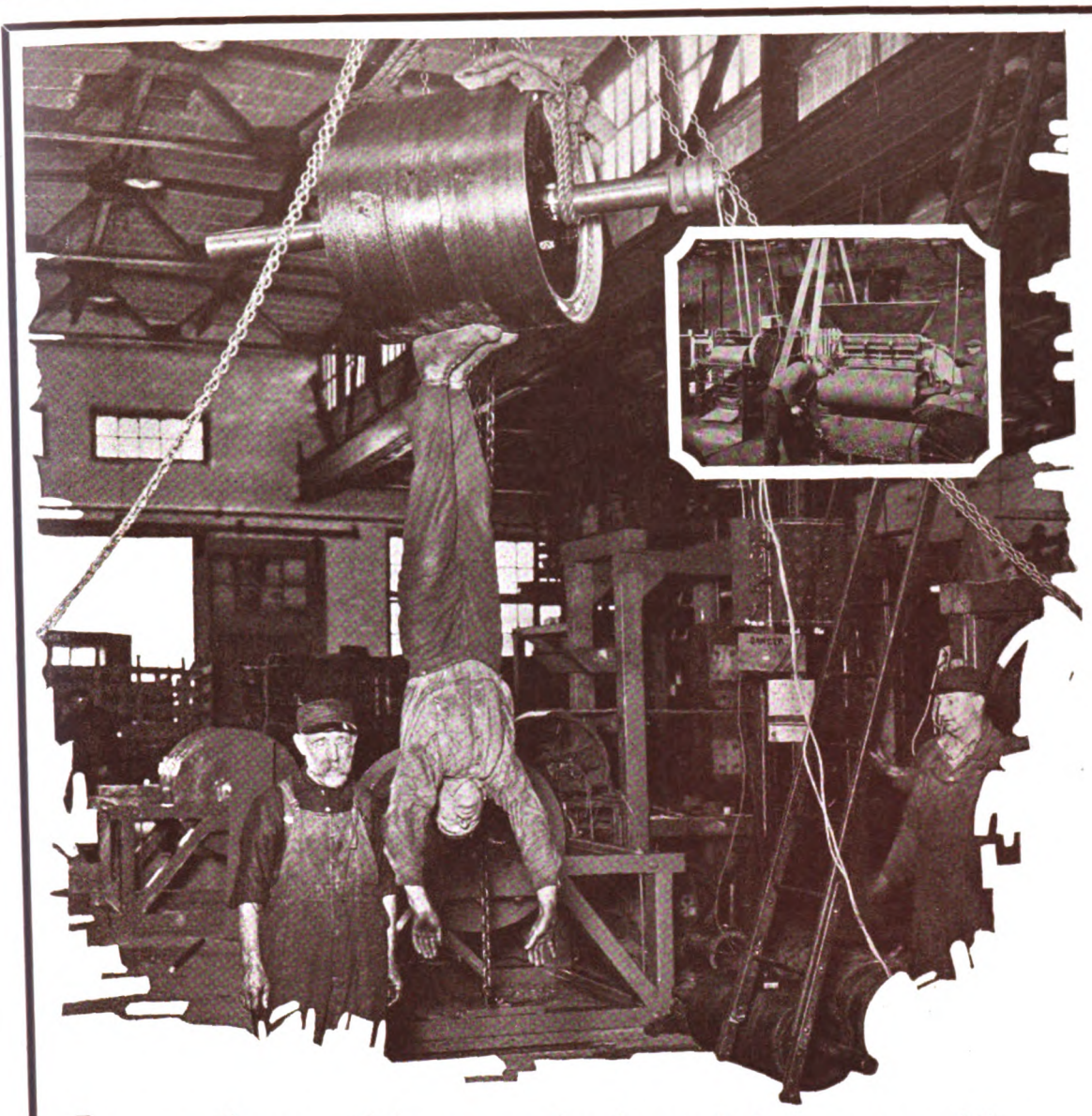
Under the third classification—the removal of minute particles from a finished product—the following applications are of interest. In the preparation of food stuffs whether for human beings or beasts, impurities must be eliminated. Most food stuffs in their preparation are ground and from that process more or less iron finds its way into the finished product. The grinding surfaces themselves wear off or a piece of iron may find its way into the grinder only to be ground up into many small bits. Then again in the final bagging or packing of the food stuff, pieces of iron are introduced carelessly or unavoidably. Many cases are on record where cows and hogs have died from the effects of eating iron ground up with the food material. Actual figures show that in 1922 alone 25,000 heads of cattle died from this cause. The death of so many hogs by what has presumably been called "hog cholera" has been diagnosed as coming from iron in the food, firmly and finally lodging in the digestive organs. In like manner, iron in a dainty bon bon or in mademoiselle's choicest face powder is an undesirable element.

The iron which nature has so promiscuously scattered among her sands and clays must be removed before the ceramist or potter can use it for making his china and porcelain. The blue specks and minute blisters found on inferior ware is iron.

While a few of the applications in the three general classifications outlined above have been enumerated, there are many others of a novel and interesting application to be cited. Among these are the removal of iron from blast furnace slag, where the iron is reclaimed and the slag for use as, ballast, portland cement, etc., is materially improved. In paper and pulp mills the iron is removed from the pulp to improve the quality of the paper. In glass plants iron is very deleterious. Clear crystal glass is impossible with iron present in the ingredients. Tin cans and other iron are worth reclaiming by magnetic separation from the garbage as is also plated silver ware from restaurant refuse. The sorting of brass hooks and eyes from similar ones made of iron is a magnetic separator problem as is also the removal of buckles, nails, etc., from scrap rubber.

The U. S. Bureau of Standards and technical Universities employ separators for research and laboratory problems. In the abrasive industry where either the natural or manufactured abrasive is employed, iron associated with it detracts from its abrasive qualities. In short, wherever there exists a mixture of magnetic and non-magnetic material, a magnetic separator of standard or special design should be employed.

Digitized by Google



Learn how this new industrial force will—

1—Protect crushing and grinding equipment
2—Cut the cost of sorting and separating operations
3—Raise the quality of many manufactured products

A natural force, magnetism, has in the past few years gained for itself recognition as a powerful industrial servant. As applied in Dings "High Intensity" Magnetic Separators, it is serving industry in many money making ways.

Dings Magnetic Pulleys are protecting crushing and grinding equipment from damage by tramp iron. Freedom from crusher breakdown, from repair costs and from interrupted production is assured. The strength of a Dings Magnetic Pulley is shown by the illustration above; the pulley is holding the man only by its attraction for the iron in his shoes.

Wherever materials of even slight magnetic susceptibilities are to be sorted or separated, Dings Separators soon pay for themselves. Dings Magnetic Separators are used by the Frances Hook & Eye Co. to separate brass and iron hooks and eyes—by the Winchester Repeating Arms Co. to sort out shells with and without steel caps—by the Crown Cork and Seal Co. to remove crown caps from cork—by the National Screw and Tack Co. to extract tacks from sawdust—by an ever increasing number of manufacturers in a constantly widening list of miscellaneous uses as suggested by the listing opposite.

In hundreds of manufactured products the presence of iron is injurious—in drugs, chemicals, food products, and in the products listed opposite. Dings Magnetic Separators of the simple pulley type or of more highly specialized types remove this iron and raise selling prices and demand.

Don't you want to know how Dings Magnetic Separation can make money for you? Then send the coupon below to Dings engineers—specialists in Magnetic separation with a wealth of experience gained in installing over 3500 machines. Send the coupon to the Dings Magnetic Separator Co., 1404 Smith St., Milwaukee, for the bulletins, for a visit from a Dings engineer, or for directions for sending a sample for magnetic analysis at only a nominal laboratory fee.

See phone book for branches in New York, Denver, Richmond, Detroit, Chicago, Pittsburgh, Cleveland, St. Louis, El Paso, Birmingham, Cincinnati, Los Angeles, Portland, Ore.

Dings *High Intensity* MAGNETIC SEPARATION

Know the wide range:

In mines, mills and smelters—
Dings Separators protect crushers from damage by tramp iron. Highly specialized types refine and reduce minerals and ores at low costs and with high recoveries.

In milling industry—
Dings Separators extract tramp iron from conveyed grain, preventing grain dust explosions and fires. They remove small particles of iron from feed as it is sacked.

In iron foundries—
Dings Separators reclaim iron, coke and moulding sand from refuse and dump piles.

In non-ferrous foundries—
Dings Separators free brass and other non-ferrous metals of iron. In the inset opposite, separators at the Michigan Smelting and Refining Co. are removing iron from brass borings. Twelve machines have been installed here in eleven years.

In rubber reclaiming—
Dings Separators remove studs, chain links and other bits of iron from old rubber before it is fed to the rolls for grinding.

In glass plants—
Dings Separators remove iron from cullet more cheaply than hand pickers. They extract iron from glass sands. Iron in glass causes discoloration.

In potteries—
Dings Separators remove iron from pottery slip, assuring freedom from black specks in the china.

In rock crushing plants—
Dings Separators protect crushers from the danger of breakage from tramp iron. This danger is ever present in quarries and in the manufacture of cement and gypsum.

In power plants—
Dings Separators, where coal is crushed or where fuel is pulverized, protect the crushing equipment.

In cotton seed mills—
Dings Separators protect linters and hullers by removing stray iron from cotton.

In garbage reclaiming—
Dings Separators remove cans and other scrap from the refuse.

In miscellaneous manufacturing—
Dings Separators at some stage of production, remove iron where iron is injurious. The list of products in this classification is almost endless, and includes: drugs, chemicals, sugar, salt, food products of all kinds, cattle and poultry foods, batteries, carbon, ammunition, chicory, crucible clay, gas mantels, copra, vegetable oil, chocolate and cocoa, paper, pulp, ink, abrasives, glue, distillery and brewery products, talc, celluloid, starch, asbestos.

In laboratories—
Dings Separators are used by universities, commercial laboratories, consulting engineers, the Navy, U. S. Bureau of Mines and U. S. Arsenals.

Mail this coupon for bulletins→

I am interested in magnetic separation for;

☐ Please send the bulletin ☐ Have an engineer call
☐ Send directions for sending sample for analysis

Firm .....
Address .....
My Name .....

Ind. Ill. 6-23.

Digitized by Google

The Latest Answer to High Fuel Costs

(Continued from page 20)

rounded with air enough to burn it completely. Combustion takes place instantaneously when the heated particles are heated to the temperature required. A striking example of the rapidity of the burning of powdered coal, as compared with lump coal, is found in the coal-dust explosions which sometimes take place in mines. Frequently the atmosphere of the mine becomes so laden with the very fine coal dust that the mere spark from an electric trolley wire, or other source, will explode the mixture, causing serious damage to life and property. The burning of powdered coal is, therefore, more in the nature of an explosion, due to the rapid combustion of the fuel and the resultant sudden liberation of a large volume of gas.

The fine particles of coal dust burn completely with less excess air supply than does lump coal, since each particle is so small that the air immediately surrounding it is practically sufficient for the combustion of its entire mass. With pulverized coal, therefore, the air supplied to the furnace is very little in excess of what is actually needed for combustion and the cooling effect of the excess air is much less than with the ordinary coal-fired furnace. The furnace temperatures are, consequently, much higher, and the efficiency and economy are greater. In some cases this amounts to 15 per cent. saving in the annual coal bill.

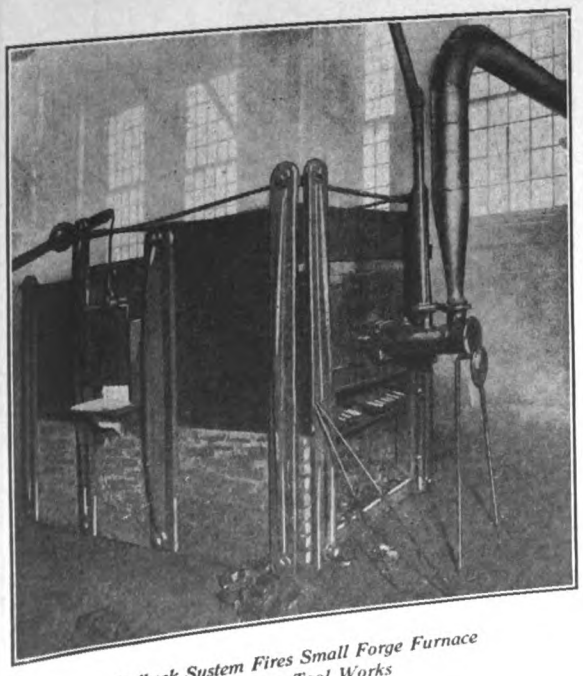
Because of the rapidity of combustion of pulverized coal and of the ability to liberate a large quantity of heat energy in a short space of time, such installations are able to accommodate sudden peak loads with comparative ease, maintaining a fairly constant steam pressure in spite of sudden and widely varying steam demands. The assurance of constant steam pressure at all times has in many cases been responsible for actual appreciable increase in plant production.

The rapid and complete combustion, coupled with recent improvements in furnace design, has resulted in a smokeless operation, even at high overloads, which has been more than successful in meeting the requirements of the most stringent smoke ordinances. Smoke, in itself, is caused when unburned furnace gases meet the much cooler boiler tubes, are condensed and form fine soot particles, which pass out the stack. In pulverized coal installations, there is seldom more than a faint gray haze issuing from the stack, consisting largely of fine ash particles, which have found their way through the setting.

Naturally, the problem of ash disposal is quite different from that of the ordinary plant. When pulverized coal burns, the ash is melted by the intense heat into a liquid spray, which trickles down the furnace lining and falls into the ash pit. Slagging is sometimes prevented by allowing the ash to fall upon a suitable water screen, which chills the vitreous slag, rendering it

VERONA TOOLWORKS
PITTSBURGH

Making High Grade Forged Tools with Pulverized Coal



Holbeck System Fires Small Forge Furnace at Verona Tool Works

The Verona Tool Works, Pittsburgh, are satisfied with the results obtained during four years' use of

Holbeck Pulverized Coal System

They have no difficulty in maintaining their high standard of quality in the Railroad Tools which they manufacture.

Their Production Departments are free from bins, motors, or complicated apparatus of any kind.

There is no method as satisfactory as the Holbeck System for serving a large number of small furnaces.

PULVERIZED COAL EQUIPMENT

Write for Bulletin No. 600

The Bonnot Company
CANTON, OHIO

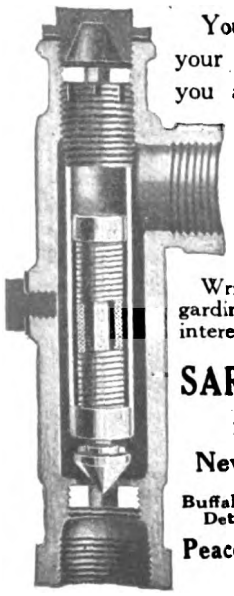
Digitized by Google

A BIG SAVING HERE

You can economize in power and equipment by installing the Steam Trap Sarco.

You can then save one-third the price it would have cost to buy ordinary traps. You can eliminate the expense of building platforms and digging pits—for the Sarco is screwed right into the pipe line. And you can effect a big saving in fuel because, on account of its small cost, you will be able to trap every point that requires trapping, thus draining off all condensate as soon as it forms.

Furthermore Sarco Traps will cut down repair bills, for they have but five parts compared with as many as forty-three in some traps. Consequently, there are fewer parts to carry in stock—fewer parts to wear out and need replacement.



You can safeguard your judgment until you are sure that the Sarco will do as claimed, as we will ship same on 30 days' free trial.

Write for particulars regarding free trial offer and interesting booklet R-31.

SARCO CO., INC.

236 Broadway

New York City

Buffalo Chicago Cleveland Detroit Philadelphia

Peacock Bros., Limited

Montreal

STEAM TRAP SARCO

light and brittle, and preventing it from fusing together into a solid mass.

Nearly one-fourth of the ash is collected in the ash pit, from which it may be removed by hand or by a pneumatic ejector. Ash is also deposited in pockets provided for the purpose in the boiler setting, from which it is also removed pneumatically. The balance, a small quantity, deposits in the flue connections or passes out the stack.

A lump of coal, in passing through a typical pulverized fuel-burning plant, drops from the coal car into a crusher and is elevated to storage bins, from which it feeds into the pulverizer mill. In one type of design, storage hoppers are provided at the point where the pulverized coal is to be burned and the coal dust and air are intimately mixed at this point, just before they enter the furnace through the burner.

In another type, the dust is fed to a fan of suitable size and speed and is blown through large pipes into the furnace. In this system air heavily charged with coal dust is circulated through continuous pipe lines to the furnace branches. The unused fuel returns to the initial point to be again blown through the line until used.

The "unit system" pulverizes the coal at or near the point where it is to be used and delivers it directly to the furnace by means of a blower, which may be an integral part of the equipment. In this type air is admitted in conjunction with the fuel.

Each system has its advantages and it is not the purpose of this article to discuss the relative merits of each but, rather, to point out how the use of such systems as described has resulted in the realization of substantial operating economies.

Accurate records and comprehensive tests have recently been made on the pulverized fuel-burning equipment of a large central station in the Middle West, consisting of eight 1300-horsepower boilers. Considerable interest was directed toward this plant with a view to ascertaining the extent of the economy that was possible. In the normal operation of the boilers, peak loads



For the man beyond the campus

FOURTEEN YEARS ago Joseph French Johnson, who was, and is, Dean of the School of Commerce, Accounts and Finance of New York University, found himself faced with a problem to which there was no satisfactory answer.

He was constantly in receipt of letters from business men, many of them occupying places of executive responsibility. The letters asked such questions as these:

"What books shall I read?"
"Can you lay out for me a course in business economics?"
"How can I broaden my knowledge of salesmanship, and accounting, and factory management, advertising and corporation finance?"

Those were pioneer days in the teaching of Business. Dean Johnson, wanting to help, yet feeling keenly the lack of suitable facilities, conceived the plan of a faculty including both college teachers and business men, and a Course so arranged that any man might follow it effectively in his own home.

Thus began the Alexander Hamilton Institute. Dean Johnson has continued as its President; its Advisory Council includes these men: JOSEPH FRENCH JOHNSON, Dean of the New York University School of Commerce; GENERAL COLEMAN DUPONT, the well-known business executive; PERCY H. JOHNSTON, President of the Chemical National Bank of New York; DEXTER S. KIMBALL, Dean of the Engineering Colleges, Cornell University; JOHN HAYS HAMMOND, the eminent engineer; FREDERICK H. HURDMAN, Certified Public Accountant; JEREMIAH W. JENKS, the statistician and economist.

To young men of college age, the Institute says: "Matriculate at a college or university if you possibly can; there is no substitute for the teacher." To older men, the universities and colleges, in turn, are constantly recommending the Modern Business Course of the Institute.

THESE COLLEGES and universities, and 80 others, have used parts of the Alexander Hamilton Institute Course in their classroom work.

Amherst College
Boston University
Brown University
Bucknell University
College of the City of New York
Columbia University
Cornell University
Dartmouth College
Georgetown University
Georgia School of Technology
Lafayette College
Massachusetts Institute of Technology
McGill College
New York University
Northwestern University
Ohio State University
Pennsylvania State College
Syracuse University
Trinity College
University of Alabama
University of California
University of Chicago
University of Michigan
University of Indiana
University of Pittsburgh
University of Texas
Vanderbilt University
Virginia Polytechnic Institute
Washington and Lee University
Williams College
Yale University

It is a Course for the man beyond the campus; the man who is already in business and cannot leave; the man who wants to supplement his college education; the man who has never been to college. If you are such a man, may we send you, without obligation, a copy of "Forging Ahead in Business"? It tells how 200,000 men have profited by a business training founded upon university principles, and conducted in accordance with university ideals.

ALEXANDER HAMILTON INSTITUTE
807 Astor Place, New York City

Send me "Forging Ahead in Business" which I may keep without obligation.

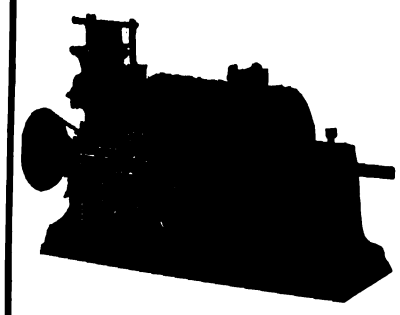
Name .....
Print here
Business Address .....
.....
Business Position .....

Canadian Address, C. P. R. Building, Toronto; Australian Address, 73 Hunter Street, Sydney.

Copyright, 1923, Alexander Hamilton Institute

Digitized by Google

Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway
New York

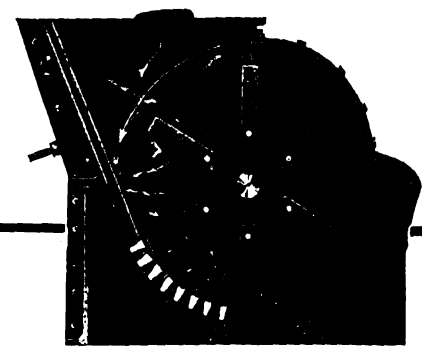
as high as 225 to 250 per cent. of rating were experienced. The records and data collected showed that the heat actually absorbed by the boilers ran as high as 82 to 86 per cent. of the total heat in the coal. Such a performance is unheard-of in ordinary coal-fired plants, where maximum average efficiencies (including banking periods) of 75 per cent. are considered high.

One of the engineers intimately connected with this work had occasion to remark, in commenting upon the installation, "Not the least of the advantages is the quietness and cleanliness of the operation, the absence of dirt and clutter inseparable from the handling of loose coal in the fire room. There is no fuel visible, no objectionable dust and none of the roar attending the use of some of the methods of firing liquid and gaseous fuels, while the station has all the neatness of an oil-fired plant."

Another plant, where four 500-horsepower Wickes boilers are equipped with pulverized coal burners, operates at 175 pounds pressure, 100 degrees superheat and from 150 per cent. to 200 per cent. of rating continuously. This installation is not much more than a year old, but, although practically new, the management and engineering staff have already expressed general satisfaction with its operation. In fact, they have gone a step further and stated it as their opinion that the greater cost of the installation, as compared with a stoker-fired plant, has been more than offset by the higher operating economies that are possible and by the ease and flexibility of operation. To date no trouble has been experienced with the arches, furnaces and brickwork, showing that correct and improved designs have made possible high operating economies, without excessive maintenance costs.

In a certain 600-horsepower plant, again in the Middle West, municipal smoke ordinances made vital changes necessary in the design and arrangement of the plant. After a thorough consideration of all the problems involved, powdered coal burners were selected as the logical so-

(Continued on page 75)



GRUENDLER Swing Hammer Crushers & Pulverizers is an original design adapted to more Crushing, Pulverizing, Cutting problems than any other known type in the World.

The Old and Sure method of Breaking, Crushing, Pulverizing, Cutting with hammer, knife or hatchet is applied in a mechanical way many thousand times multiplied, thereby giving you many thousand single hammer or cutting blows per minute in a small machine requiring very small floor space.

Stop and think of the old primitive method using thousands of men for little work and scientific method of **GRUENDLER** Crushers which eliminates all labor.

A FEW OF THE MANY PROBLEMS THAT GRUENDLER HAS SOLVED ARE:-

Crushing Coal for chain Grate or Stokers, for Cokeing, for powdered Fuel, for crushing your old Fire brick, for patching your furnace linings.

Put your Crushing and Grinding Problems up to us.

GRUENDLER

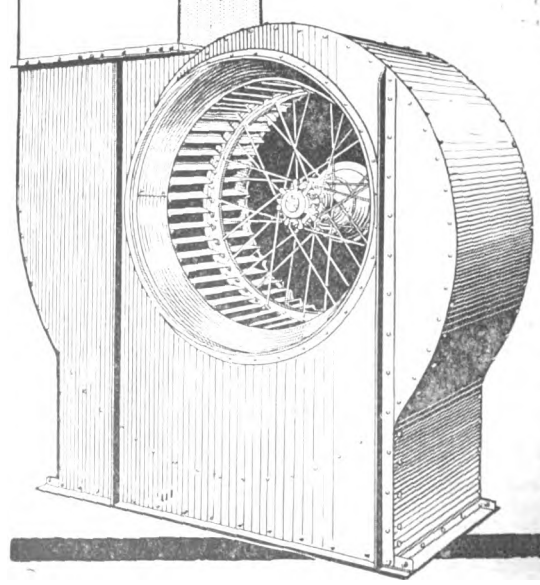
Gruendler Patent Crusher & Pulverizer Co.,
968 First St. St. Louis, Mo. U. S. A.

EFFICIENT VENTILATION

Can be obtained only through the use of equipment designed to meet the specific requirements for which it is intended.

Bayley PLEXIFORM FANS

are made in a variety of capacities from 300 to 300,000 cubic feet per minute. They are designed especially with a view of handling a maximum volume of air from a minimum of space and power requirement. Their efficiency as proved by installations in thousands of the largest industrial, public, school, theatre and office buildings, makes them prime favorites with architects, engineers and owners.



Write for Catalog

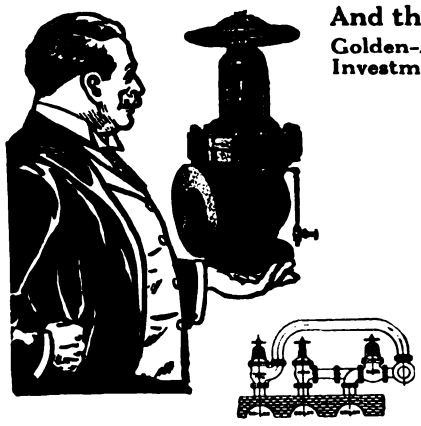
BAYLEY MFG. CO.
DEPT. (P)
MILWAUKEE, WIS.

Digitized by Google

Why did the large Steel Corps. Install 4100 GOLDEN ANDERSON

Life and Property Insurance Valves?

"There Must Be a Good Reason"



And there certainly is

Golden-Anderson Valves are a Gilt-edged Investment in safety.

"No Shut-Down When a Boiler Tube Ruptures"

"No Explosion When a Steam Pipe Bursts"

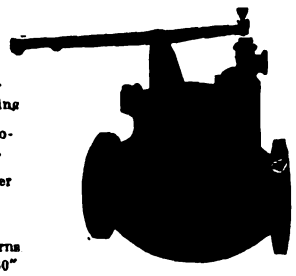
DOUBLE EXTRA HEAVE VALVES

„Every Valve Sold with a Postive Guarantee."

1. They will cut off a boiler instantly when a boiler tube bursts.
2. They will prevent live steam from entering a cold boiler, thus insuring safety to workmen.
3. They instantly shut off the steam from all boilers when a pipe breaks.
4. They can be opened or closed by hand in the same manner as ordinary gate or globe valves when fitted with the patented safety latch.
5. Double cushioning prevents absolutely all pounding, or chattering.
6. Automatically equalize the pressure between all boilers.
7. Are equipped with double Corliss Dash Pot that cushions it opening and closing.
8. Cannot pound, spin, stick or chatter.
9. Every valve sold with a positive guarantee.
10. Safeguard the men and safeguard the property.

GOLDEN-ANDERSON

Pat. Automatic Cushioned Stand Pipe Valves



Especially adapted for coke quenching

No metal-to-metal seats

Air and water cushioned

Angle and Globe patterns Sizes 3" to 30"

GOLDEN-ANDERSON

Cushioned Electric For Fire Service Water Service Valves



No waste of current as it is only on solenoid a few seconds on either opening or closing of valve.

May be closed and opened from remote points electrically; also hand operated.

Air and water cushioned. No metal-to-metal seats. Virtually indestructible.

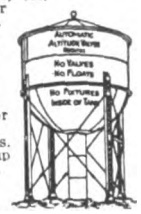
Sizes to 30 in.

GOLDEN-ANDERSON

Pat. Cushioned Automatic Controlling Altitude Valves

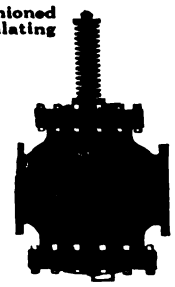


1. Automatically Maintain uniform Water Levels in Tanks, Standpipes, Reservoirs, etc.
2. For High or Low Pressure. Always Dependable.
3. No Floats or Fixtures used.
4. No Water Hammer or Shocks.
5. Sizes up to 30 in.



GOLDEN-ANDERSON

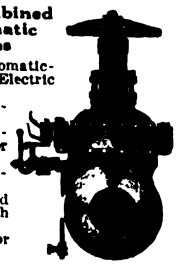
Pat. Automatic Cushioned Water Pressure Regulating Valves



1. Maintain a constant reduced pressure regardless of fluctuations on high pressure side.
2. Perfectly Cushioned by water and air. No metal-to-metal seats.
3. The best valve made for maintaining a constant low pressure where consumption is continuous.
4. Operates quickly or slowly as required—No attention necessary.
5. Positively no hammering or sticking. Sizes to 24 in.

GOLDEN-ANDERSON

Pat. Cushioned Combined Throttle and Automatic Engine Stop Valves



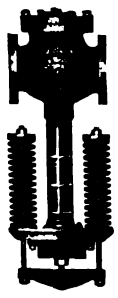
1. Operate 3 ways: Automatically, by Hand, or by Electric switch.
2. Prevent Fly-wheel Explosions.
3. "Double Corliss" Cushioned—No Pounding or Sticking.
4. Contains No Tight Fitting Parts.
5. Furnished in Angle and Globe Patterns for High or Low Pressures.
6. "Always Ready for Service."

GOLDEN-ANDERSON

Patent Automatic High and Low Pressure Steam Traps



1. The first new departure in steam trap design in years.
2. 50 to 100% greater capacity than other traps of similar sizes. Full area through discharge valve.
4. Extra Heavy Throughout—Very Durable—Will last a lifetime—and **Always Works.**
5. Furnished Semi-Steel and Cast Steel for Superheat.



GOLDEN-ANDERSON

Pat. Automatic Cushioned Steam Pressure Reducing Valves

1. Maintain a constant reduced pressure.
2. Thoroughly cushioned.
3. No hammering, chattering or sticking.
4. No auxiliary valves or small by-passes to clog up.
5. No wire drawing.
6. Only one adjustment from the outside.
7. Double extra heavy throughout—practically indestructible.

GOLDEN-ANDERSON

Pat. Automatic Double Cushioned Check Valves

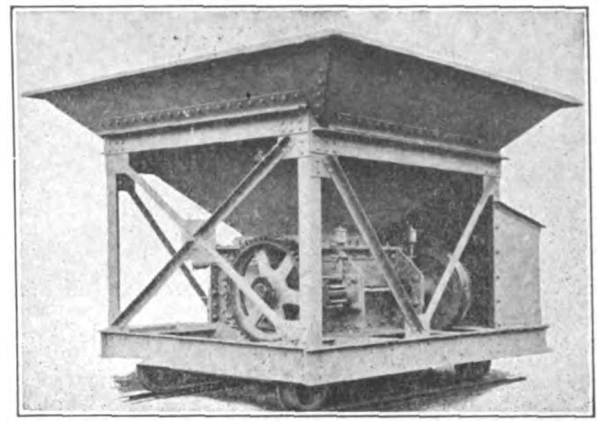


1. Especially adapted for Water Service.
2. For High or Low Pressure.
3. Thoroughly Cushioned. No Chattering, Hammering, or sticking.
4. Globe or Angle Patterns up to 30 in.
5. Especially adapted for hydraulic elevator service.

Golden-Anderson Valve Specialty Co.

1306 Fulton Building **Pittsburgh, Pa.**

"PENNSYLVANIA" ARMORFRAME SINGLE ROLL COAL CRUSHER.



In a recent Paper Mill installation, the "Pennsylvania" ARMORFRAME mounted on a Steel car receives the coal in its Steel Hopper direct from the storage pile by means of locomotive grabbucket Crane. The car runs on the Power House roof and delivers the coal to the stoker hoppers by gravity. The Crusher is motor driven.

This is the simplest method of coal handling and uniform preparation where local conditions permit its use.

Tramp Iron has no terrors for the "Pennsylvania" ARMORFRAME with its massive steel construction and Triple Tramp Iron Protection.

"Pennsylvania" Coal Preparation Machinery includes Bradford Breakers for crushing, cleaning and sizing large tonnages at Mines, Gas Works and Central Stations; "Pennsylvania" Hammer Crushers for By-Product Coke Plants and preliminary to pulverizing, and "Pennsylvania" ARMORFRAMES for Mines and Industrial Power Plants.

Outline your problems when sending for Coal Preparation Bulletin No. 6001.

PENNSYLVANIA CRUSHER COMPANY

1320-1325 Stephen Girard Bldg.
PHILADELPHIA, PA.

What Real Insurance have you in your plant?

The best equipped plants have the best efficiencies

What if an explosion did destroy your power house? It's insured, isn't it? But would the insurance money be enough to build you a new plant? And what would become of your business meanwhile? And would your men, once laid off, wait around for you to start up again? No, certainly not. Any explosion that could wreck your power house, would probably wreck your business as well.

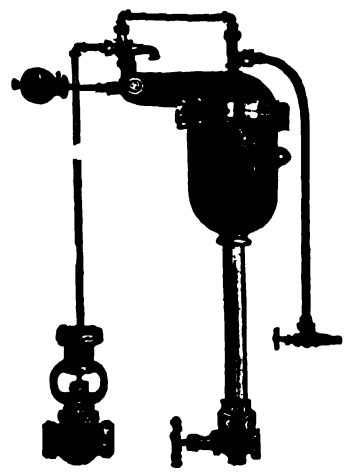
Act Now

You can do everything in your power to safeguard your plant against boiler explosion due to low water by installing Vigilant Regulators.

Their operation depends on gravity—always positive. No expansion tubes to buckle or to get out of line. No diaphragms to crack. No floats to fail. You can actually see it work. The movement of the outside weighted levers gives evidence of its operation.

Get our engineers' recommendation. No obligation.

VIGILANT Feed Water Regulator



Write for the catalog today.

The Chaplin Fulton Mfg. Co.,

28-36 Penn Avenue
Pittsburgh, Penna.

Digitized by Google

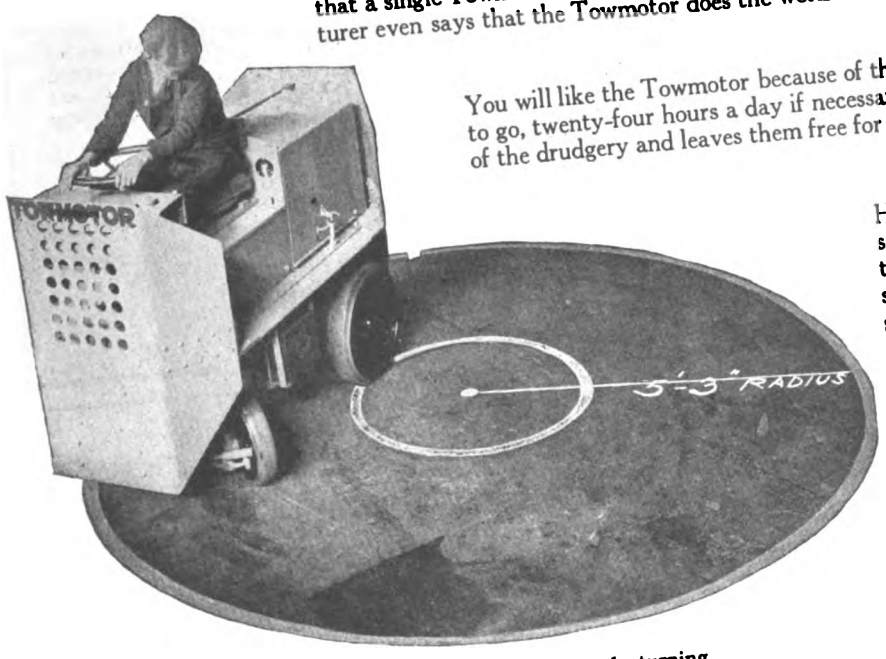


Chase Metal Works, Waterbury, Connecticut

HOW MANY MEN WOULD IT TAKE TO MOVE THIS LOAD WITH HAND TRUCKS? HOW LONG WOULD IT TAKE? AT PRESENT LABOR PRICES, HOW MUCH WOULD IT COST?

With a Towmotor you can do it quicker, easier and cheaper. With Towmotor Haulage Equipment, you can solve some of the problems presented by the present shortage and consequent high cost of labor. Users tell us that a single Towmotor releases from three to ten men for other work—one Cleveland automobile manufacturer even says that the Towmotor does the work of fifty men.

You will like the Towmotor because of the way it does its work, and because it is always ready to go, twenty-four hours a day if necessary. Your workmen will like it because it relieves them of the drudgery and leaves them free for more congenial work.



Model C Towmotor, with 5 foot 3 inch turning radius. It gets into—and out of—the corners.

Have you seen the newest Towmotor, the model C? It is smaller than the other models, gets through narrower aisles, turns shorter corners and gets out of tighter places. The sturdiness and high grade construction that have distinguished Towmotors, have been retained in this model, which shows every indication of becoming just as popular as its predecessors.

Perhaps a Towmotor (or a fleet of Towmotors) is just what you need, just what you have been looking for. Full details and any information we can give you are yours for the asking.

THE TOWMOTOR COMPANY
1226 East 152d St., Cleveland, Ohio.



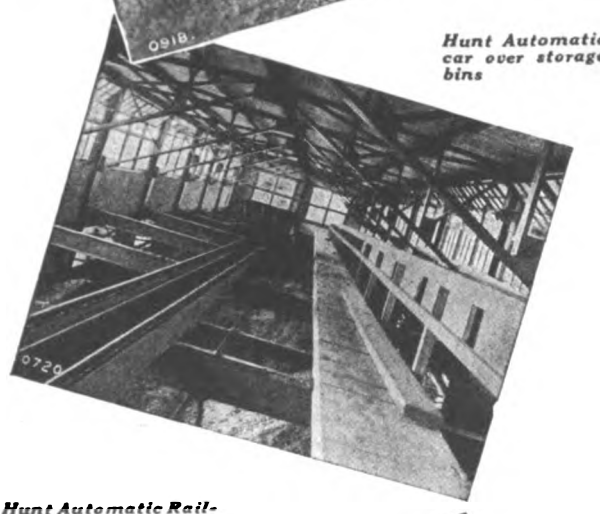
American Dock Co., New York.

THE TOWMOTOR

Digitized by Google



Hunt Automatic Railway car dumping load in yard



Hunt Automatic car over storage bins



Hunt Automatic Railway car showing loading end

45 Years Perfect Service

with only minor repairs

The Hunt Automatic Railway shown in the top picture, has handled bulk material used in a big Sewer Pipe plant for over 45 years, requiring in all that time only the replacement of *the cable and one pulley block.*

This, and other examples of veteran service covering periods of ten years and upward, is sufficient proof of the staunchness of this rugged type of Hunt Cost Cutting Equipment. But there are other features to recommend its adoption, especially where economy in ground space is essential; also where the saving of time, labor and money is desired, or necessary.

HUNT AUTOMATIC RAILWAY

Absolutely self-acting from time of starting with load, until it returns empty and ready for another load.

The cost of operating is confined to *one* man's wages. The workman at the loading end fills car and starts it down track,—but does not accompany it—it automatically dumps the load at any desired point and returns under action of gravity.

Coal can be accurately weighed without delay or extra expense, by placing platform scales at loading end, (in the tracks). The loader weighs the car and while car is running down the tracks, enters the weight in the tally book.

Track and supports can be easily erected; the whole system is free from any confusion of switches, turnouts, ropes, etc. No loose pieces to get stolen or lost; nothing to take care of or put away. Cars left just as used and are ready for work at any time. Good for at least 10 years service without repairs.

Can also be used for transporting sand, phosphate rock, clay, ores, limestone, salt, cement and similar bulk materials from railroad cars and vessels to storage bins or pockets.

The Efficiency, Economy and Safety of the Hunt Automatic Railway is fully described in Booklet 20-3

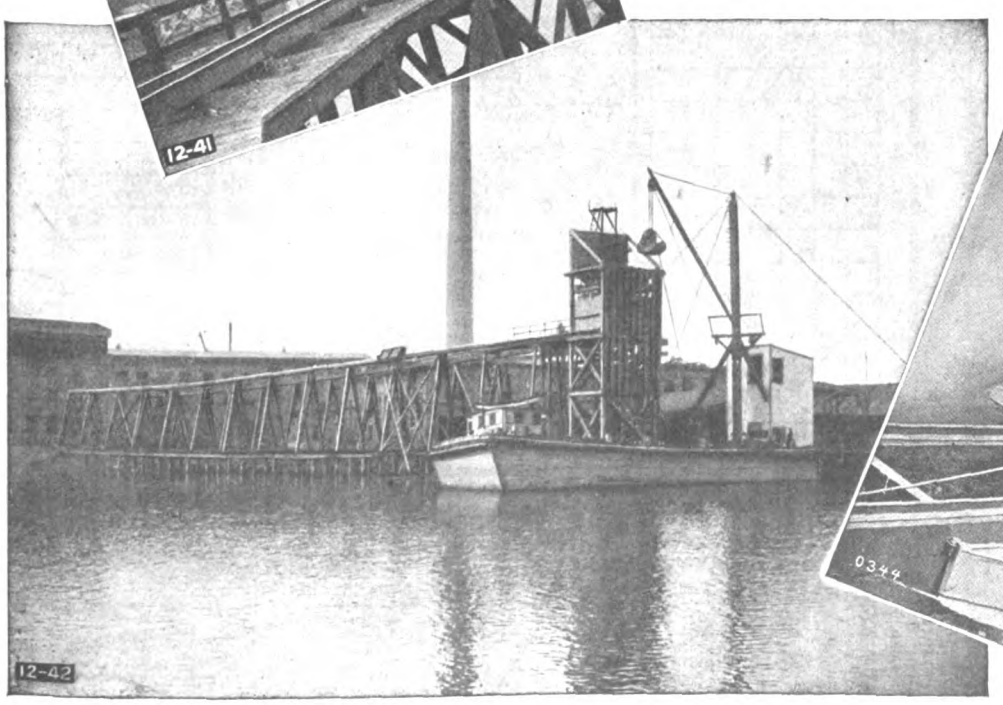
C. W. HUNT COMPANY, Inc.,

WEST NEW BRIGHTON, NEW YORK CITY

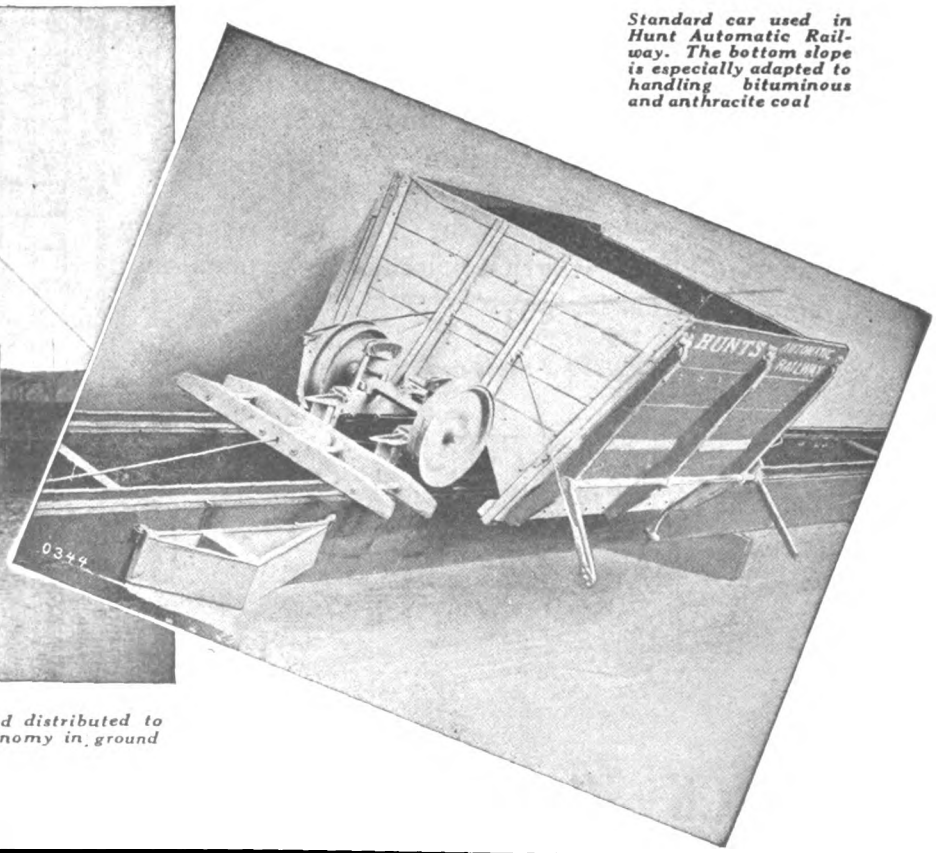
New York Office, Whitehall Building

Phillips, Lang & Co., Inc.
431 So. Dearborn St.,
Chicago, Illinois.

Ernest F. Learned,
141 Milk Street,
Boston 9, Mass.

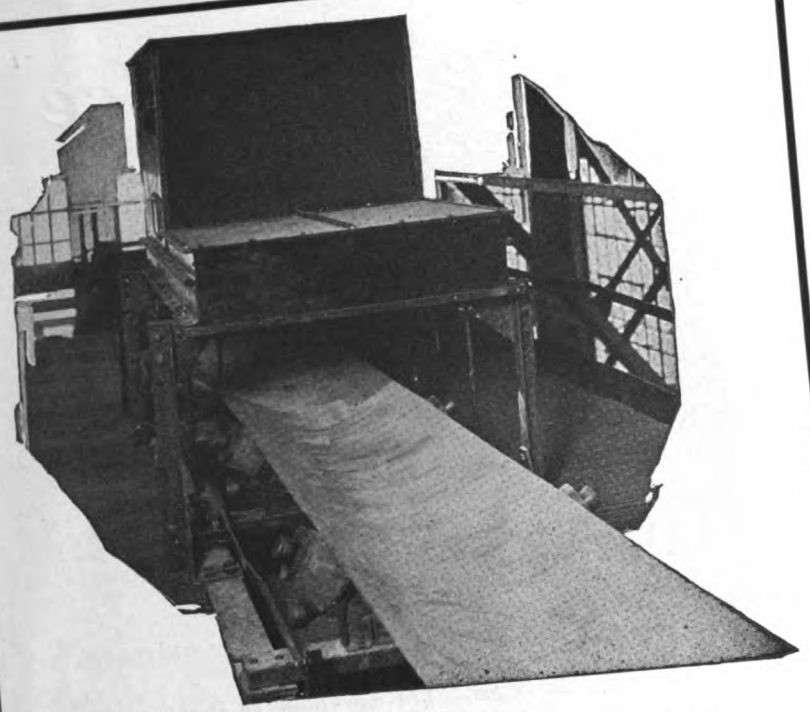


Coal received by water, is hoisted by a grab bucket on a Hunt mast and gaff and distributed to storage under the trestles of Two Hunt Automatic Railways. The utmost economy in ground space is thus secured



Standard car used in Hunt Automatic Railway. The bottom slope is especially adapted to handling bituminous and anthracite coal

Digitized by Google



Do You Pay for Material You do Not Receive?

Thousands of dollars may be lost if there is no accurate check on your receipts. Bill of Lading weights are not always correct.

Hundreds of concerns now accurately check all conveyor handled materials bought and sold with the

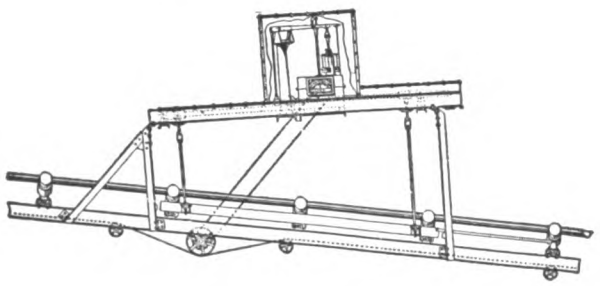
MERRICK
Conveyor Weightometer

The Merrick weightometer records the weights of materials automatically, as they are carried along on the conveyor. No interruption—no weighman required—*accuracy guaranteed 99%.*

The weightometer shows exactly the amount of materials handled and gives a check on production. It saves time and labor and is a profit-making investment.

Let us tell you more about the Merrick Conveyor Weightometer. The "Merrick Circulars" explain in detail the many advantages.

Write for them now.



MERRICK SCALE MFG. CO.,
180 Autumn Street, PASSAIC,

GRAPHICS WILL TELL

This check list of supplies will help you

EDEXCO GRAPHIC RECORD SUPPLIES

EDEXCO MAP MARKERS

COLORED MAP PINS
NUMBERED MAP PINS
CELLULOID TACKS
MAP RINGS
MAP CORD
GLASS BEADS
GUMMED SYMBOLS
SIGNAL FLAGS
CARD SIGNALS



EDEXCO OUTLINE MAPS

STATES
UNITED STATES
COUNTIES, R. R.'S, CITIES OF 25M
WORLD

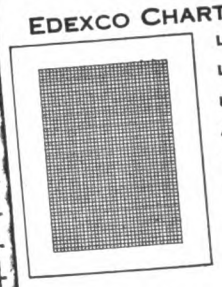


EDEXCO CORK MAP MOUNT



SWINGING LEAF FIXTURES

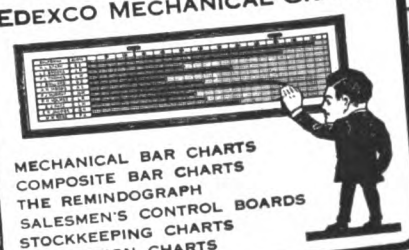
EDEXCO CHARTING PAPERS



LARGE SIZE
LETTER SHEET SIZE
LOGARITHMIC
ARITHILOG, SEMI-LOG
YEARBYDAYS
BARGRAPH
POCKET SIZE
COLORED CRAYONS

BOOKS ON GRAPHICS

EDEXCO MECHANICAL GRAPHS



MECHANICAL BAR CHARTS
COMPOSITE BAR CHARTS
THE REMINDOGRAPH
SALESMEN'S CONTROL BOARDS
STOCKKEEPING CHARTS
PRODUCTION CHARTS

EDUCATIONAL EXHIBITION COMPANY
527 Custom House St., Providence, R. I.

Send me details on items checked above.

Name ..... Title .....
Firm ..... St. & No. .....
City ..... State .....

Also here is $1.00 for the
EXPERIMENTAL SET
of map pins, charting paper, map mount, and descriptive literature.
Get this set and see how graphics might fit your own plans.

Digitized by Google

(*Continued from page 70*)

lution of the question. One of the determining factors in this case was the ease of handling the fuel. In the estimation of the plant engineer, the equipment has more than measured up to their expectations. No smoke or ash is discharged from the stack, even when operating at 125 per cent. of rated capacity.

But that is not all. In view of the material reduction in the labor cost of handling its coal from the railroad cars to the boiler room and other parts of the plant using coal, this company has decided to equip all its furnaces and core ovens with powdered coal burners.

During the six months and more that this plant has been in operation there has been no destructive effect on the tubes from excessive heat, although slight trouble was experienced with the furnace lining. It is expected that this trouble will be remedied by the use of the proper high-temperature brick.

The use of powdered coal in boiler furnaces has not yet reached the same high level of development that may be claimed for stokers. Great credit, however, is due to those manufacturers, engineers and users, whose ideas have contributed to the many improvements, which have made these systems rivals of, and in many cases superior to, other methods of firing. The rapid progress has seen the successful solution of nearly all the major problems involved in daily continuous operation. A few minor problems remain, which are receiving consideration today, with a view to developing powdered fuel systems to an unusually high plane of economy and efficiency not possible with other systems.

Painting the Factory

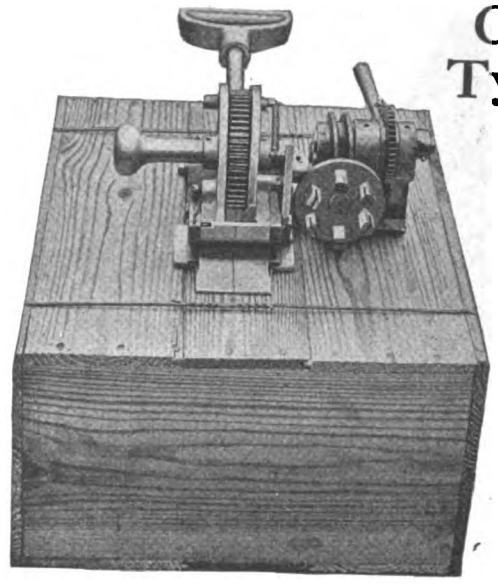
(*Continued from page 16*)

ing of factory interiors than ever before. Here, good painting of walls and ceilings makes cleaner, brighter more sanitary work places. When properly done and in such a tint as to diffuse daylight and artificial light to the greatest degree possible, it reduces the risk of accident, makes more cheerful surroundings for employees, lessens their eye strain and results in increased output. Men and women appreciate the advantages of clean, well-lighted shops. It raises their morale and they do more and better work in such places than in a factory where the rooms are unevenly illuminated, with dust and soot sticking to the walls and giving a gloomy aspect that communicates itself to the workers themselves.

The commonest method of applying paint is with a brush. The rising cost of hand labor, however, makes this an expensive process where any large amount of painting is to be done. By making use of the principle utilized in an ordinary atomizer, there is available a type of apparatus, now very widely used that will accomplish about eight times as much work in a day as can be done by one man with a brush. This is the spraying process. It is also called the air brush and the paint gun method. Compressed air, supplied from a portable, motor-driven compressor, or from an outlet from a main in buildings equipped with a compressed air system is used to force paint out of a container and through a hose leading to a nozzle from which the paint is ejected in a spray and thereby directed to any spot desired. The painter has both air and paint supply directly under control, can start or stop the spray at will and apply exactly the needed quantity to the surface in the quickest and most economical manner. Some of the illustrations accompanying this article show the use of paint spraying apparatus, including the use of an extension pipe attached to the end of the air and paint hose to enable a man to reach surfaces far above his head and thus usually avoid the use of scaffolding or ladders. Incidentally, this lessens the hazard of a type of accident very common in painting work.

It is stated that one coat of paint applied by a good spray-

(*Continued on page 77*)



CARY'S Seal Tying Machine

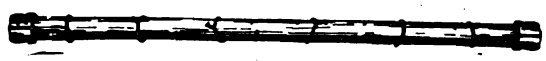
The sturdiest and most efficient machine ever devised for the application of wire bands at any desired tension to all kinds of boxes, crates, etc.

Simple but Positive

in operation. Fool-proof and built to stand hard service. Weighs only 14 pounds.

The manner in which the wire is automatically sealed insures maximum strength and leaves no sharp ends to protrude and cause damage.

CARY'S Capped Bundled Wire



The wire with the patented shoulder

The Only Perfect Wire for Use in any Wire Tying Machine

A special drawn round galvanized wire in 13 and 14 gauge. The 13 gauge wire is packed in bundles containing 250 pieces; 14 gauge, 400 pieces in a bundle. Furnished in any length desired.

The patented shoulder holds the wire securely in any tying machine and absolutely prevents slipping. This is an exclusive feature.

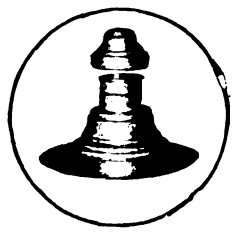
Our method of bundling insures every wire being in perfect condition when received by you.

Prices and discounts furnished on application

CARY MANUFACTURING CO.

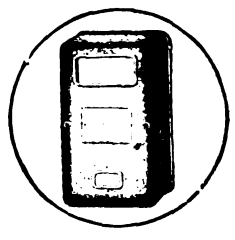
Manhattan Bridge Plaza — Brooklyn, N. Y.

G.P.&F. Service

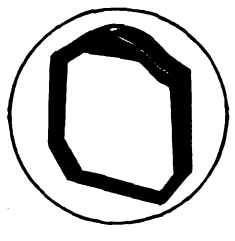


Specialists in STAMPINGS— SHEET METAL PARTS

This is not a mere statement but is based on performance records.



For the past 41 years we have been specializing in pressed metal parts until now, G. P. & F. Service means the facilities of a 15 acre plant where 1200 workmen produce 100,000 finished parts daily.



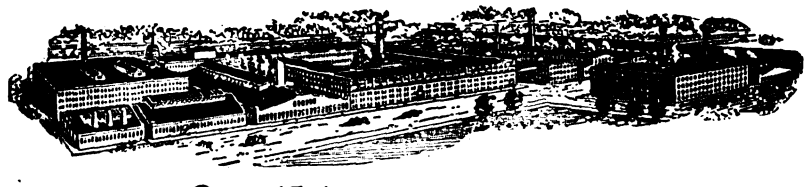
This to you means Stampings and Sheet Metal Parts delivered to your plant cheaper than you can produce them in your own plant.

Send us your blue prints or samples for estimates. We also develop pressed parts for replacing castings, forgings and wooden parts at a saving to you. Write to-day.

GEUDER, PAESCHKE & FREY CO.

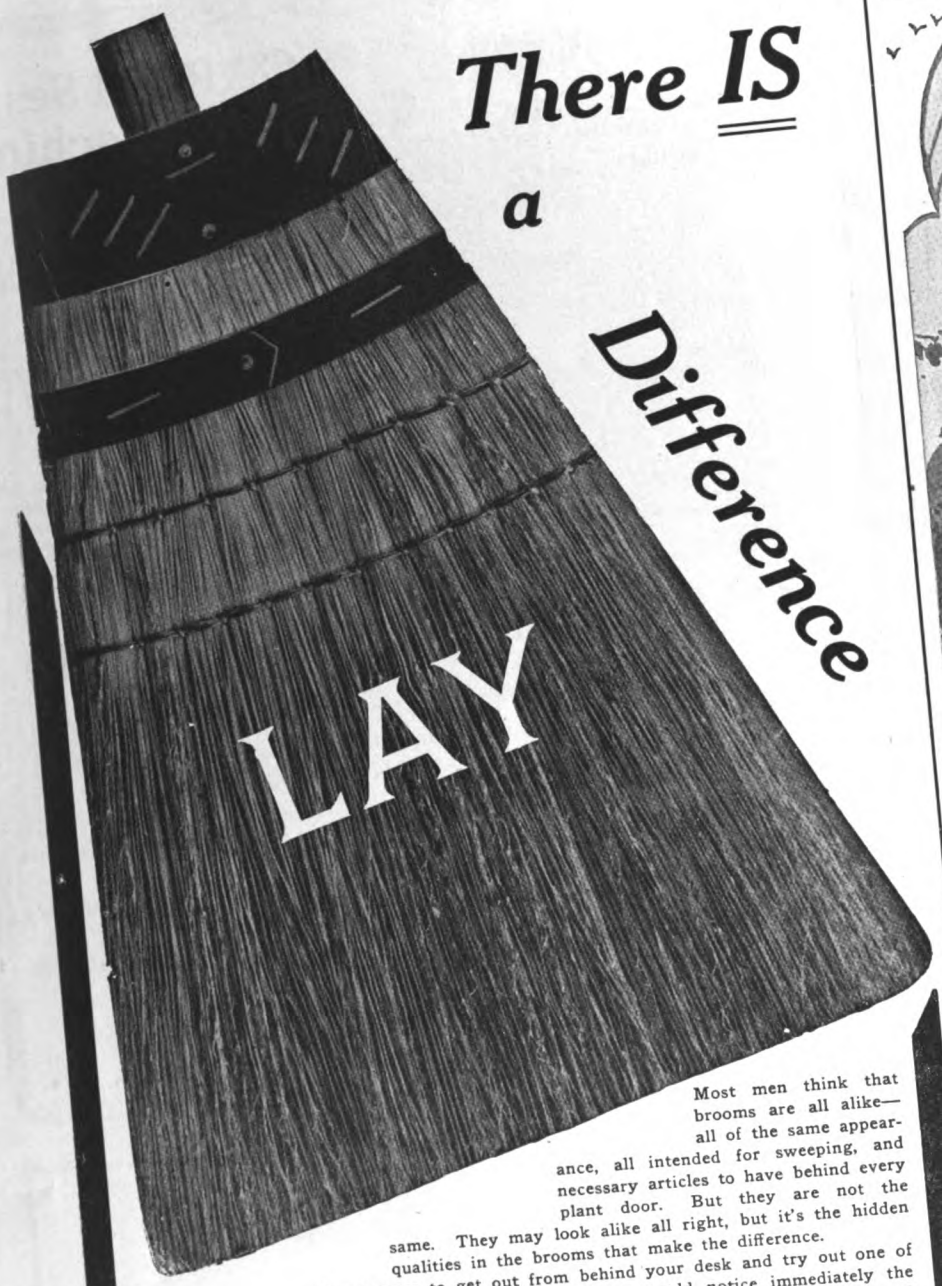
1450-1750 Canal St. — Milwaukee, Wisc.

Chicago Branch, 352-358 W. Ohio St.



Over 15 Acres of Floor Space

Digitized by Google



Most men think that brooms are all alike—all of the same appearance, all intended for sweeping, and necessary articles to have behind every plant door. But they are not the same. They may look alike all right, but it's the hidden qualities in the brooms that make the difference.

If you were to get out from behind your desk and try out one of the Lay Metal Case Brooms, you would notice immediately the even balance, the wide sweeping tip—2" wider than all other industrial brooms—and the live resiliency of the fibre. These qualities in Lay brooms make for quicker, more efficient work from your sweepers.

Pioneers in the industry—three generations of broom builders—forty-four years of construction experience stand behind the adoption of Lay brooms by 90% of the steel industries, 40% of the railroads and more than 4,000 industrial plants. It is the Strength, Durability and Economy—the hidden qualities in broom construction—that have built up this wide demand for Lay Metal Case Brooms. This record and the constant inspection of each broom in the course of manufacture gives The Lay Company confidence in putting its unqualified guarantee on every one of its products. Our brooms make good, or we will.



WRITE FOR LATEST "LAY" PRICES TO-DAY

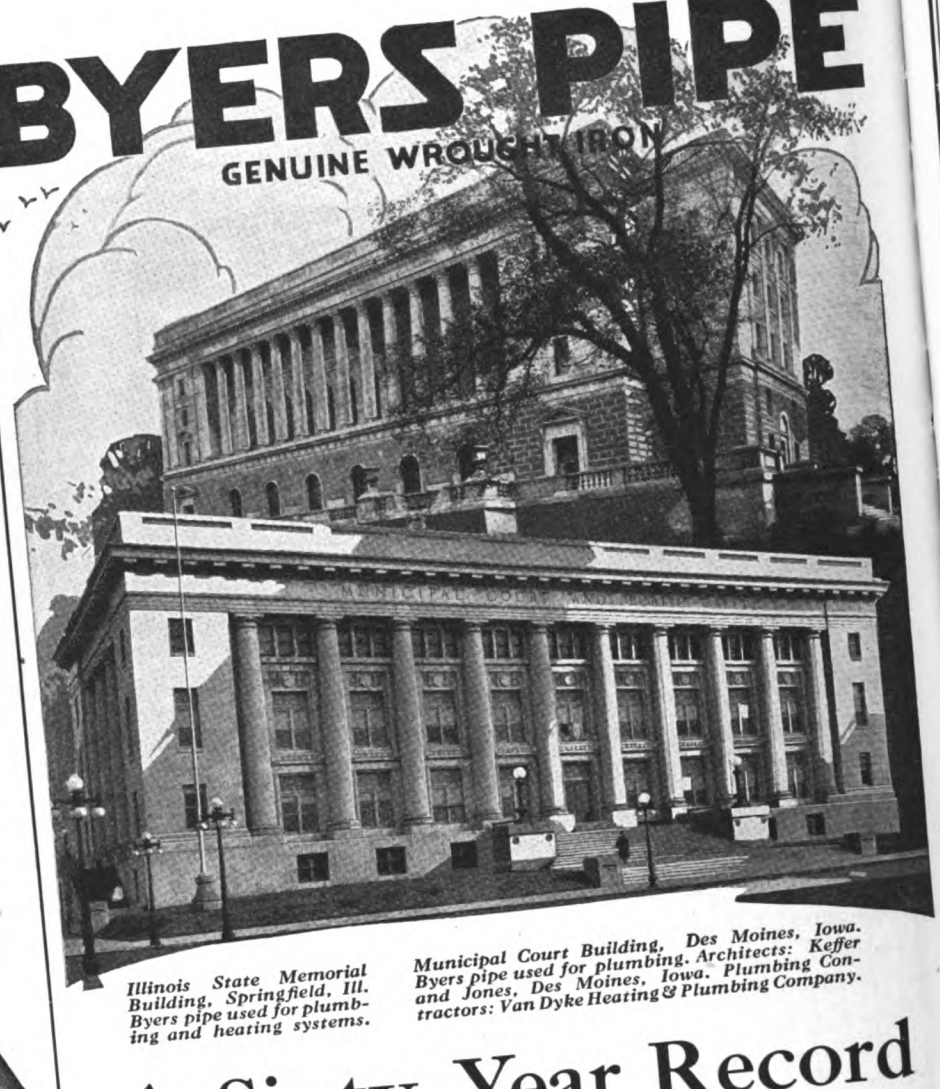
The Joseph Lay Co.
120 College St.
RIDGEVILLE INDIANA



No. 256-144 Steel wire Push Broom
No. 412 Bench Brush
No. 28-H Bassine Whisk
No. 253-165 Bass Push Broom
No. 3-W Steel wire Casting Brush

BYERS PIPE

GENUINE WROUGHT IRON



Illinois State Memorial Building, Springfield, Ill. Byers pipe used for plumbing and heating systems.

Municipal Court Building, Des Moines, Iowa. Byers pipe used for plumbing. Architects: Keffer and Jones, Des Moines, Iowa. Plumbing Contractors: Van Dyke Heating & Plumbing Company.

A Sixty-Year Record

THE durability of pipe used for steam, water, gas and air lines, is predicated on its resistance to corrosive attack. In plumbing, heating, sprinkler, refrigeration and power systems, even a small amount of daily corrosion in the course of a few years may destroy the most elaborate pipe system.

That Byers pipe installed upwards of 30, 40 and 50 years ago is still found intact in many of our older buildings, practically unharmed by corrosion, proves the rust resistance of the metal from which it has been made uninterruptedly since Civil War days.

With such a record, it is not strange that Byers pipe should be first choice for home, business and public buildings alike.

Whether the comparison is with cheaper or more expensive pipe, the economy of Byers pipe for most purposes is a matter easily demonstrated by consulting its service record, (See Byers bulletins Nos. 26-A, 27, 30, 32 and 34—free on request.)

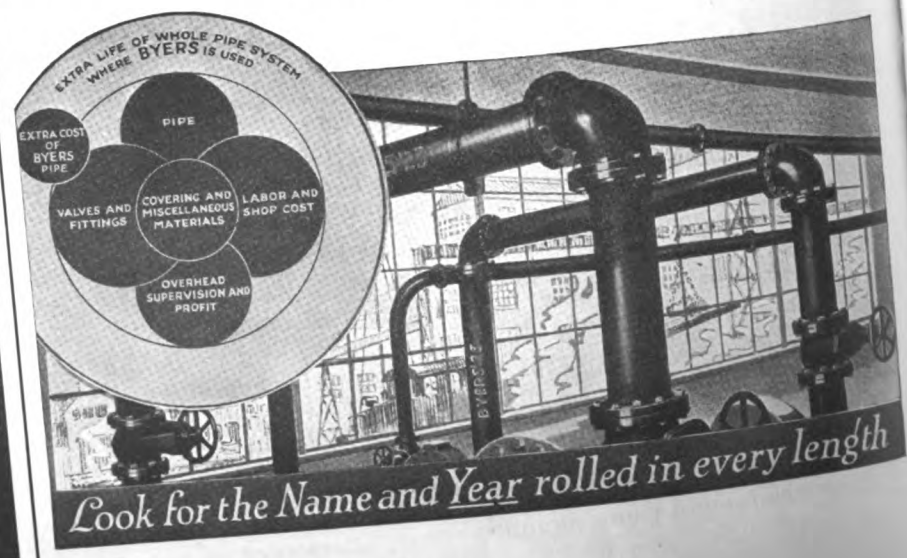
Based on installation cost, the extra cost of Byers pipe is trifling. See diagram. Ask for Bulletin No. 38 "The Installation Cost of Pipe."

A. M. BYERS COMPANY, PITTSBURGH, PA.

Established 1864

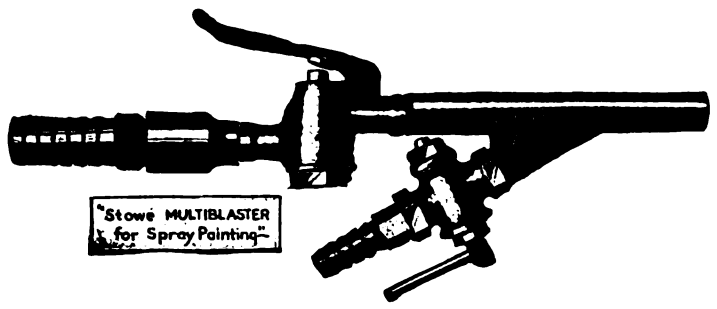
NEW YORK PHILADELPHIA BOSTON CHICAGO CLEVELAND HOUSTON

Distributors in all Jobbing Centers



Digitized by Google

Put the MULTIBLASTER to work on your next Cleaning and Painting Job



Economy in Labor—Time—Materials

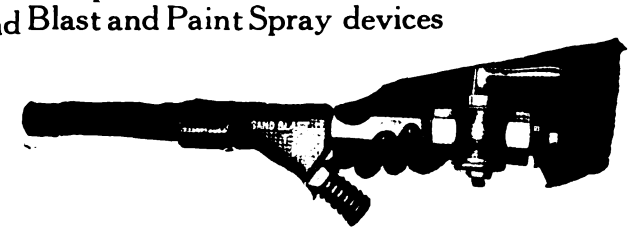
A STOWE MULTIBLASTER outfit for sand blasting and painting will replace 6 hand workers on metal surfaces and 18 to 30 men on concrete or wooden surfaces. It does the job better, gives more uniform distribution of paint and eliminates waste.

With the MULTIBLASTER one man can thoroughly cover an area of 3,000 sq. ft. per hour ***with one coat.*** This would require six men by the brush method and three coats of paint instead of one.

The simplicity of design and rugged construction of the MULTIBLASTER has led prominent manufacturers to equip their portable compressed air units with our Sand Blast and Paint Spray devices



"The Man Behind the Gun"
(COPYRIGHTED)



10 Day Trial Offer

We are willing to have you prove in your own plant just what the MULTIBLASTER can do in saving time, money and labor, just as it is doing in scores of industries, wherever painting and cleaning surfaces or machinery is required. Send for a MULTIBLASTER for 10 days free trial and pay for it only after you are convinced of its merits.

Pick out the one most applicable to your requirements from the list below, and send in your order to-day. If a fair trial does not prove satisfactory return it—we'll stand the expense.

Any outfit shipped by parcels post or express for 10 days' trial; ready for instant attachment to your air-lines.

They require no tanks. The sand is syphoned direct from pit, barrel or the pile (from canvas trough or jacket when cleaning high structures) and the paint from any convenient container.

List of Prices

	Price	Wgt. Lbs.	Hose Suction Inch	Pressure Lbs.
Standard Size Sand Blast	$30.00	8	1	80-90
Medium Size Sand Blast	18.00	6	¾	60-70
Bench Blast	15.00	3	½	40-50
Paint Spray	12.00	2	½	40-50

Prove its value to you before you pay a dollar

George M. Stowe, Jr.
Manufacturer

68 Forest Ave., Buffalo, N. Y.

(*Continued from page 75*)

ing apparatus is equivalent in covering capacity to two coats put on with a brush. Conservative estimates by reliable manufacturers give the capabilities of the spray method as covering 500 square feet of surface per hour for satisfactory finish, dependent somewhat on the character and consistency of the paint. Of course there is a technique in the use of the air brush just as there is with the bristle brush. There is a certain distance, 6 or 8 inches from the surface, at which the nozzle should be held in order to produce the best results and use the minimum of paint applied in the proper thickness.

One man with a hand brush can apply from 2½ to 3 gallons of paint on 1,000 square feet of surface in an eight-hour day. Provided with a good spraying outfit he can put on from 15 to 20 gallons on 6,000 square feet in the same time.

Some comparative costs of painting with a brush and with the spray method are interesting and convincing. In general, painting contractors estimate that from 50 to 75 per cent. of the cost of any painting job is the labor cost. In a certain building, the cost of applying paint to the ceiling was $3.72 per 100 square feet using the hand brush. When spray painting was tried, the cost was $2.09 per 100 square feet. In wall painting, with a brush, for which it was necessary to use scaffolding, the cost of the job was $2.30 per 100 square feet; while with the spray, for which no scaffolding was used, the cost was only $1.34 per 100 square feet. It should be noted in this comparison that the cost of power and an allowance for depreciation were included in the determination of the cost of the spray method. Another comparison, derived from actual work, showed that to paint 280 square feet of surface required 3 hours, 10 minutes time, at $1.00 per hour hand-labor with a brush and $1.80 worth of paint. To cover this same surface by air brush painting used a little more paint (the cost of this being $2.00), but the job was done with the same labor in *twenty minutes!*

Exterior painting of a factory is, as has been stated, for the purpose of its preserva-

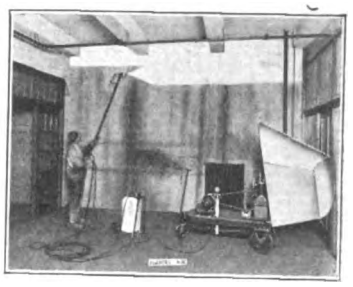
Paasche
Portable Painting Outfits



For rough work or fine work in all atmospheric conditions.

PROPERTY MAINTENANCE At One-Sixth The Usual Labor Cost

One man operating Paasche air painting equipment does the work of a whole crew.



Used extensivey for daylighting factories.



For quickly Painting Everything Everywhere, with any kind of materials.

Always instantly Ready Dependable, Durable.

Portability itself an item of great economy.

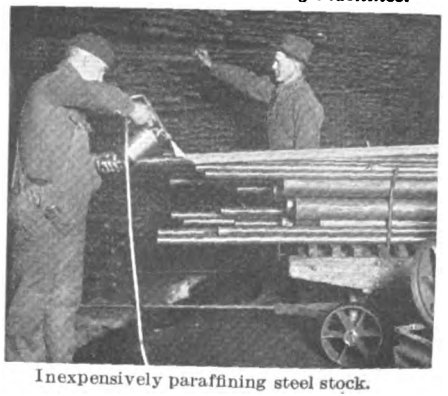
The Paasche Air Brush is a marvel of simplicity and efficiency. It has 12 Superior Features, including independent air and material supply. No clogging, no cleaning. Our catalog is ready for your careful study. Our salesmen-engineers are at your disposal.

Over 50,000 Paasche Air Devices in Daily Use.

Paasche Air Brush Co.

1909 Diversey Parkway Chicago

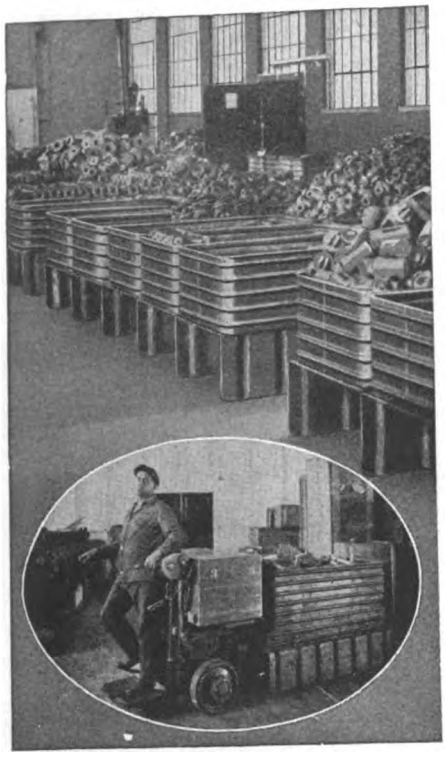
Also makers of Pneumatic Rubbing Machines and Portable Painting Machines.



Inexpensively paraffining steel stock.

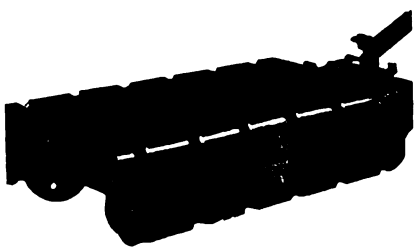
Digitized by Google

TRUSCON ALLOY PLATFORMS STEEL



Steel Platforms Cut Cost of Handling and Conveying

Whether you use hand or power lift trucks, or a power hauling method, or an overhead conveyor system, or cranes, etc., you can save money through the use of Truscon Alloy Steel Platforms and Boxes.



Their sturdiness and scientific design ensures them long life without upkeep expense. Quantity production permits low prices. Made in numerous standard sizes and also to meet special requirements. Our extensive experience enables us to solve unusual problems.

Truscon Boxes for Steel Platforms

Skeleton boxes fitting any size platforms are furnished in various depths. They are either welded securely to the platform or equipped with steel stakes which slide into the ribs of the platform. Made of heavy gauge steel, reinforced with deep stiffening ribs and flanged edges. We make boxes to meet every requirement.

Tell Us Your Requirements for Anything in Pressed Steel Parts

Truscon Steel Company

YOUNGSTOWN, OHIO

Sales Offices in Principal Cities

tion; interior painting is concerned directly with production and with the health and morale of employees. Factory interiors are painted for the purpose of giving more light by diffusing daylight or artificial light more uniformly. It is usual to find factories under-illuminated and unevenly illuminated. This is just where good painting is such an asset to the plant. Walls and ceilings when painted white or in light colors are not only cleaner, more cheerful looking places, but the light tones scatter and diffuse the light more than do dark or dirty surfaces. White painted walls and ceilings are equivalent to an increase in the window space, because they diffuse the light admitted by the windows. A dark or dirty wall, on the other hand, reflects no light; what diffusion is secured in such a place comes from reflection from other objects like benches, machinery, etc.

White is commonly agreed upon as preferable to light colors for interior factory painting. There are special cases where some light color tints have been found best adapted to the work to be done, but they are exceptional. There is a difference of opinion, however, concerning the kind of surface a white paint for factory interiors should possess. By adding certain materials having the properties of varnishes, a shiny, glossy surface may be secured on a wall when the paint is dry. This looks well and is easy to clean; but possesses the disadvantage that it reflects more or less light directly. When light from an electric light bulk, or sky light from a window is reflected from this kind of surface, an objectionable glare is the result. There are too many "high lights." That sort of illumination is considered by eye specialists and illuminating engineers to be injurious to eyesight, especially for persons who are exposed to it throughout their working hours. In contrast to this gloss finish white, there is what is known as a "flat" finish, with no lustre; what most persons would call "dead white." This diffuses the light very well when first applied. Illumination measurements show that it reflects the same proportion of light striking it as



CYCLONE HOISTS
HIGH SPEED

—multiply man-power.

ONE man at the easy pulling hand chain of a Cyclone Hoist will pile more stock, load and unload more material and feed more machines than a gang of men using muscle power alone,—and do it quicker and cheaper. A Cyclone Hand Hoist traveling on a system of C-M Matchless Trolleys will release scores of men from the time-consuming, hand-lifting jobs to more productive labor. It multiplies man power without multiplying the number of men on your payroll.

Our catalog explains all the mechanical superiorities of the Cyclone Hoist, the Hoist "with the Gyrating Yoke." Capable distributors in all localities can aid you in laying out material-handling and hoisting systems.

The Chisholm-Moore Mfg. Co.
Cleveland, O.

Hoists Cranes Trolleys

(*Branches:* New York, Chicago, Pittsburgh

MEECO SANITARY DRINKING FOUNTAINS are



Practical, Tangible Assets in the Modern Factory

We guarantee their durability and efficiency.

Let us send you proof of their economy in both first cost and operation.

Chairs and Stools Lockers METAL MEECO PRODUCTS *Sanitary Washbowls Shelving*

Manufacturing Equipment & Engineering Co.

Originators and World's Largest Makers of Ice-Cooled Drinking Fountains

Framingham, Mass.

MEECO COOLERS

Digitized by Google

es a gloss surface. But the t finish soon becomes darker reason of particles of dust d soot that adhere to it. And ce adhering to such a surce, they are very difficult to ean off—practically impossble, in fact.

Either of these extremes is desirable. Without discussng the relative merits of the bstances used in factory ints, the prevailing practice pproves the use of a paint ith the whitest materials obinable as a base, combined ith enough of the proper ossy liquid to give a smooth, ightly glossy surface; one in hich the minute particles conituting the white body of the int are barely covered, yet t so directly exposed as to rm a roughened surface. his gives the maximum of ht diffusion, does not readicollect dirt or soot and can sily be cleaned. It must also composed of materials that not readily react with the pors of sulphur, ammonia, d the like. There are many es of manufacture such as xtiles, dyes, rubber, paper, cking, etc., that for this ason make the permanence of e whiteness of painted walls d ceilings a matter for seris study.

There are many parts of the ucture of a factory that reire special kinds of paint. r example, structural steel rk is always painted before pment from the rolling mill protect it from rust and corsion. In one of our illustrans a man is shown applying special kind of paint to the el frame of a building for purpose of preventing corion of the steel which often urs after it has been ensed in concrete, stone or tile rk; an occurrence particuly dangerous because it is den. Roof painting calls a special class of paints cause of the peculiar ditions of exposure to exmes of temperature and isture as well as a considern of the fire hazard.

here is also a kind of paint t can be applied to wooden uctures in order to waterof them and prevent decay. bers such as sills and ts are frequently so painted re the expense of the more al preservative treatment not considered warranted. instance, the sills of a wooden building can be brushed over at small expense with a paint made from certain grades of coal tar oil and their useful life considerably lengthened. Coal trestles, water tank supports, coke and sand bins, etc., are well adapted to such preservative painting.

Concrete floors sometimes give trouble in a factory, and in this case also, painting proves itself a worth-while expense by maintaining a hard, smooth surface that does not become dusty and that presents a good color contrast with walls and ceilings. Paint especially adapted to the treatment of concrete floors can be obtained in several colors and made of materials designed to withstand the wear and tear to which factory floors are subjected.

For painting the outdoor structures that are necessary at most large manufacturing plants, it has been usual to employ, particularly on steel work, a good grade of weatherproof paint. This kind of paint, usually having a graphite or

FACTROLITE your buildings

Buy Daylight and reduce maintenance costs to a minimum.

Conservation of waste, means to utilize what nature gives you, and not to permit anything which can be used, to be thrown away.

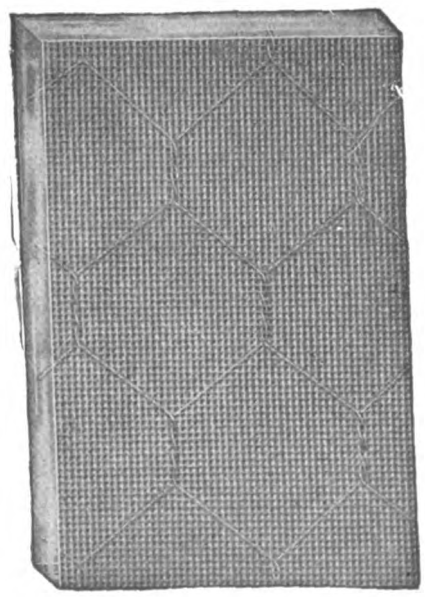
Daylight is the cheapest commodity you have. Utilize it and conserve artificial energy until daylight is gone.

The United States Government has used nearly 200,000 square feet of FACTROLITE in one building alone and many thousand square feet in others.

FACTROLITE was used because there was no other glass which would give as good results.

Daylight inside the building and no shadows. Total light transmitted through FACTROLITE 84.5 per cent. FACTROLITE is made in plain and Wire Glass.

Mail coupon attached to your letterhead and samples will be sent you immediately.



Mississippi Wire Glass Company
219 Fifth Avenue
New York

Chicago, Ill.

St. Louis, Mo.

Mississippi Wire Glass Co., 219 Fifth Ave., New York.
Gentlemen: Send me a Catalog and Factrolite Paper Weight as advertised in Industrial Management. It is understood this does not obligate me in any way.
Name .....
Address .....

Digitized by Google



No. 644 Gauntlet Glove, reinforced with flexible steel ribbons clinched over strips of tough leather. Extra leather patch on the thumb
$18.00 in dozen per lots

STOP

Lost Time from Torn Bruised Hands

Here are gloves made expressly for industrial use—for men who handle castings and other rough materials.

STEEL-GRIP GLOVES

are made up of three thicknesses of wearing surfaces and a comfortable lining—flexible steel ribbon re-inforcement clinched over tough strips of leather. They can't come loose nor hurt the hand. All gloves stitched with strong steel thread—no danger of seams ripping, burning nor tearing out.

STEEL-GRIPS save the frequent trips to the store-room for "another pair of gloves." You aid the men and increase production by furnishing them with STEEL-GRIP GLOVES.

Send for a Catalog
Try a dozen pairs.

INDUSTRIAL GLOVES CORP.
201 Fuller ton Ave., Chicago



No. 605 Short Gloves steel ribbon reinforcement and extra wearing patch in palm. $16 in dozen pr. lots

STEEL GRIP
MADE IN CHICAGO

bituminous base, is applied after a priming coat of red lead. The steel work of outdoor switching stations at factories that receive their supply of electric energy from an outside source has very frequently been protected by galvanizing the steel. So much difference in practice in this respect was noticed that recently a questionnaire was sent out by the "Electrical World" to all parts of the United States. The answers showed that for outdoor structures on electric transmission lines, both painting and galvanizing were about equally relied upon. In some localities the zinc coating afforded better protection than that of the best paint. In other cases the reverse was true. The question resolves itself into a determination in each case of the kind of impurities present in the air, such as locomotive smoke, acid fumes, etc., that would cause a chemical action whatever material was used for a protective covering on the steel structure.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC. REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of INDUSTRY ILLUSTRATED published monthly at Cooperstown, N. Y., for April, 1923. State of New York, County of Otsego, ss.

Before me appeared John H. VanDeventer, who having been duly sworn according to law, deposes and says that he is the President of the Industry Illustrated and the following is, to the best of his knowledge and belief a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Engineering Magazine Co.; Editor, John H. VanDeventer; Managing Editor, John H. VanDeventer; Cooperstown N. Y.

2. That the owners and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock are: Engineering Magazine Co.; John R. Dunlap; J. R. Dunlap, Jr.; John H. VanDeventer; Harvey Conover, Jr. All addresses same as publication office.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOHN H. VANDEVENTER.

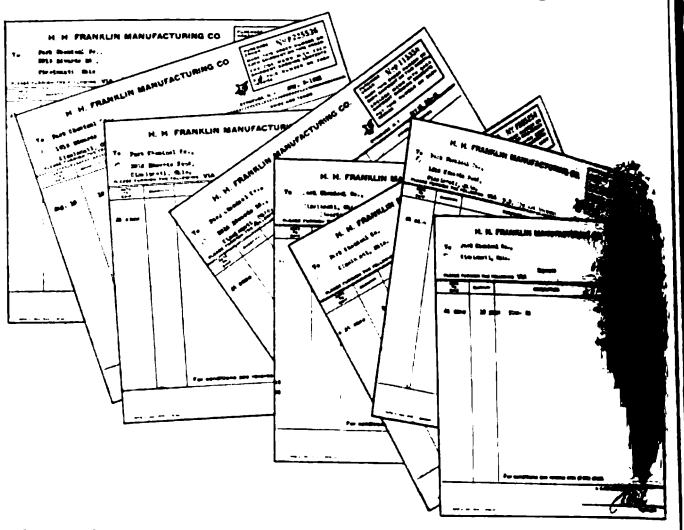
Sworn to and subscribed before me this 26th day of March 1923.

Ralph E. Finch.
(My commission expires March 1925.)

BLU-EE

TRADE MARK

Cuts Out the Glare



"Glaring light is a menace to the workers and retards production. The ideal light is a soft, cool light made by the sun's rays with the glare and heat cut out. BLU-EE keeps out the rays below the blue line in the spectrum--rays that give the heat and glare to the sunlight. Those above the blue line penetrate unhindered and the result is a diffused, filtered light, restful to the eyes and gives the worker a chance to do better work.

BLU-EE is easily applied; simply dissolve in hot water, allow to cool and apply to the windows with a paint brush. It will not rub off but can be easily removed with warm water.

We want to prove what BLU-EE can do in your plant. Try some at our risk. Fill in the coupon below and send it in at once.

PARK CHEMICAL COMPANY
3822 Edwards Road Cincinnati, Ohio

Try It Out—We Run the Risk

PLEASE send me 2 packages of BLU-EE, sufficient to cover 2000 square feet of glass. It is understood that I am to use one of the packages as directed and will remit $5.00 for both if I am satisfied with BLU-EE, and if not entirely satisfied may return the other within thirty days and you will cancel this order.

Firm Name..... Position.....

Your Name..... Address.....

THE SEAT OF
Production



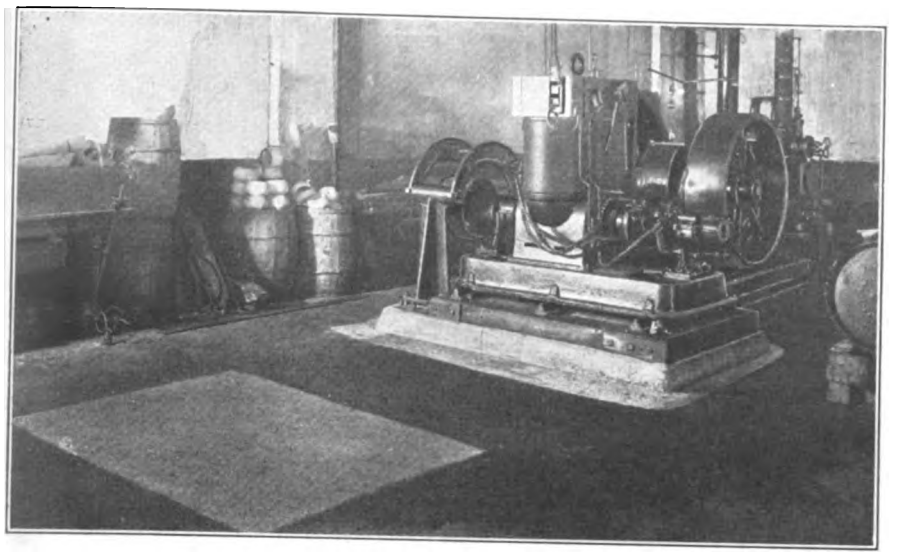
No. FS-22, Patented. Adjustable Legs and Back-Rest

Few people realize that the working girl should be measured for her working chair in which she spends one-half the time she is awake.

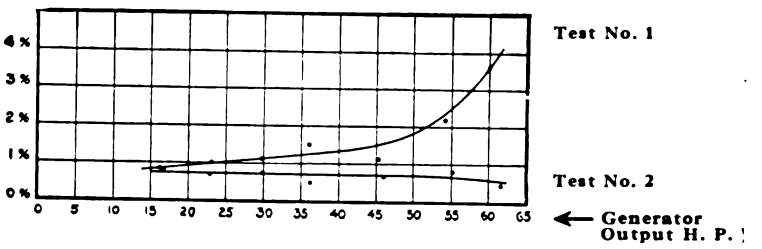
Royal Metal Mfg. Co. 2312-16 S. Western Ave., Chicago, Ill.

"Royal-Chicago" PRODUCTS
THE CORRECT INDUSTRIAL SEATING

Digitized by Google



WHERE THE TEST WAS MADE



BELT SLIPPAGE IN %

¶ Saving of belt slip 86% at 60 H. P. generator outdut OPEN DRIVE with canvas laggings on pulleys

Belt Slippage Reduced 86%

Two tests were made on the generator drive shown above. The results are shown on the accompanying chart.

The No. 1 test was with an open drive with canvas laggings on pulleys. In test No. 2 the Lenix drive was employed.

The results may surprise those who are not familiar with the Lenix It will be noted that as the H. P. advanced the Lenix not only prevented additional slippage but ***actually reduced it.*** At 60 H. P. the saving of belt slippage was 86%.

Yet this is only one of the savings effected by the Lenix. The "Five Points" at the left mention others.

If power or floor space mean anything to you—if a steady drive means anything—you will want to get the whole story about the Lenix. A post card will bring our booklet, "Saving Slippage and Space."

F. L. SMIDTH & COMPANY
ENGINEERS

50 Church Street, New York

Five Points

1—The Lenix increases the arc of contact between belt and pulley.

2—The Lenix maintains, constantly and accurately the proper tension in the sack side of the belt.

3—The Lenix saves floor space, building space and belting because of freedom in pulley locations.

4—The Lenix saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The Lenix permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

The LENIX Drive

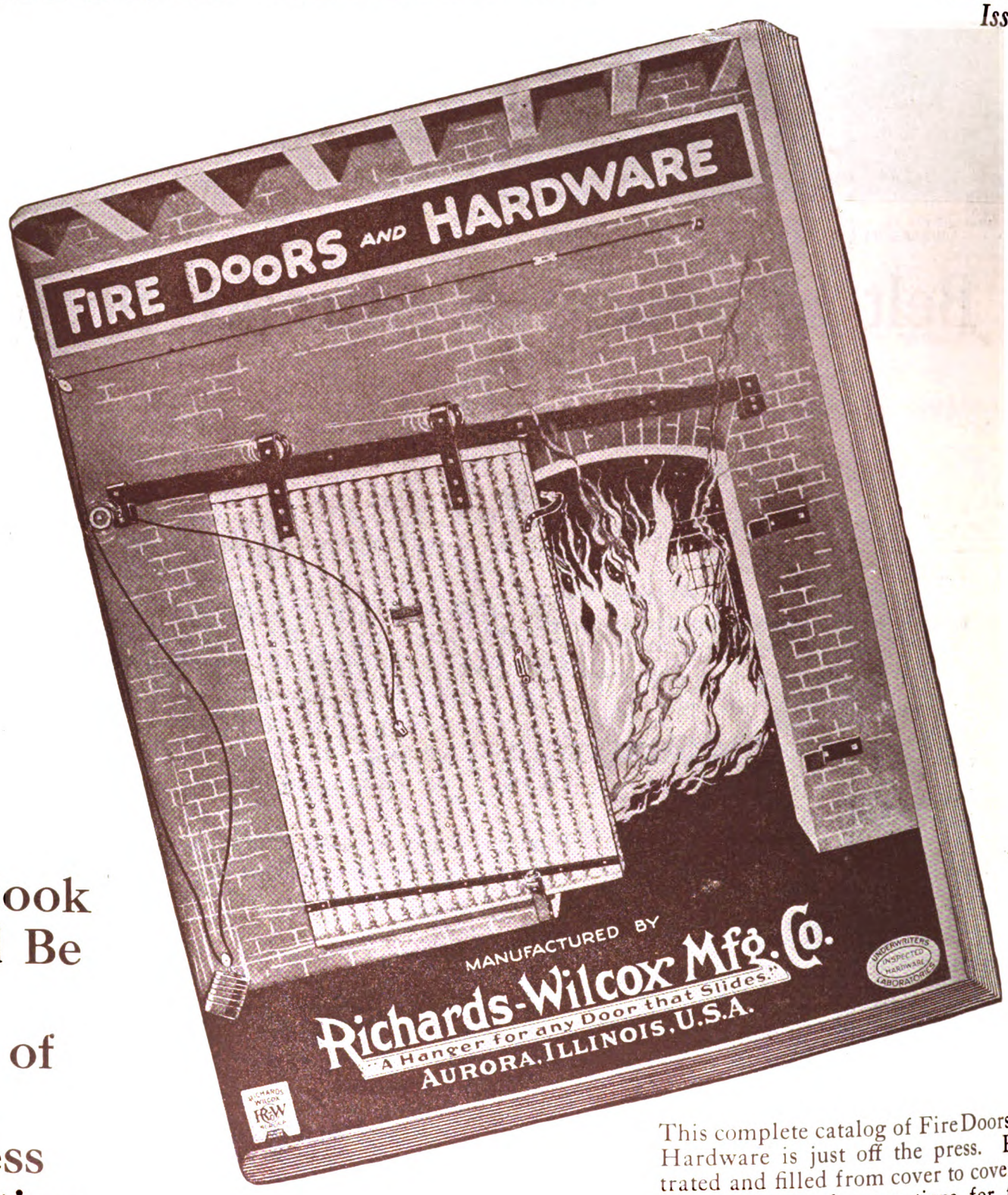
Digitized by Google

RICHARDS-WILCOX AURORA TRADE MARK

Richards-Wilcox
Quality leaves its imprint

Fire Doors Control Fires and Reduce Insurance

Most Complete Book on the Subject Ever Issued



This Book Should Be In the Hands of Every Business Executive

This complete catalog of Fire Doors and Fire Door Hardware is just off the press. Profusely illustrated and filled from cover to cover with valuable information and suggestions for fire prevention systems. A copy sent free to every executive who requests it on his business letterhead. Ask for V-25

New York
Boston
Philadelphia
Cleveland
Indianapolis
St. Louis

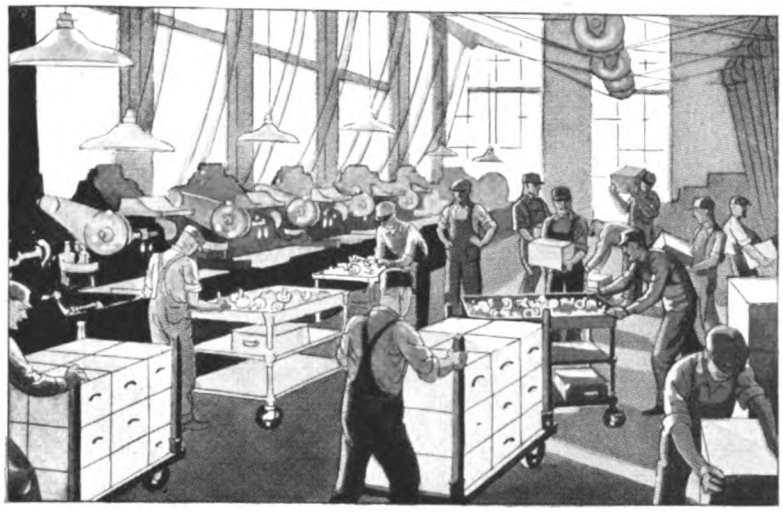
Richards-Wilcox Mfg. Co.
"A Hanger for any Door that Slides."
AURORA, ILLINOIS, U.S.A.
RICHARDS-WILCOX CANADIAN CO., Ltd.
Winnipeg LONDON, ONT. Montreal

Chicago
Minneapolis
Omaha
Kansas City
Los Angeles
San Francisco

Digitized by Google

Confusion *or* Order

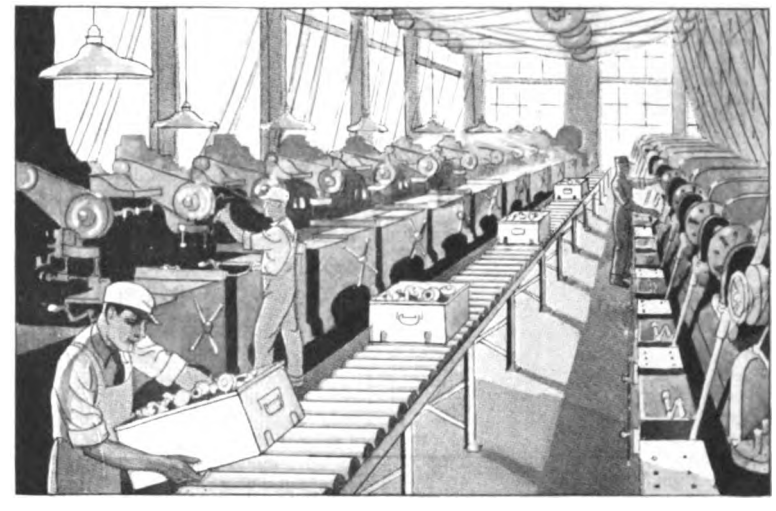
This adds to your costs



This is one picture

Trucks moving from one machine to another, crossing and re-crossing their tracks—trucks standing by machines waiting to be unloaded—porters getting in one another's way—raw materials and half-finished products cluttering up aisles—confusion and disorder—resultant slow production and high costs.

This increases your output



But glance at the second scene

Conveyors take materials in steady, regular streams through the work-room and deposit them at the workmen's elbows. Aisles are clear of goods. Available floor space is released for more machines. Materials in process are cut to a minimum, costs are lower, and production is more rapid and efficient.

YOU don't have to consider long which work-room you would rather have in your plant. But without a conveying system it is easily possible for you to have the first. This applies to your shipping-room as well as your shop.

With a conveying system you have a means of stimulating and setting the pace of production. Its speed determines the output of your workers. And when the rate of production is fixed, conveyors keep it uniform.

With an uninterrupted flow of material, operators unconsciously conform to the pace. That means larger production, from which both workers and employer profit.

Lamson service is for you

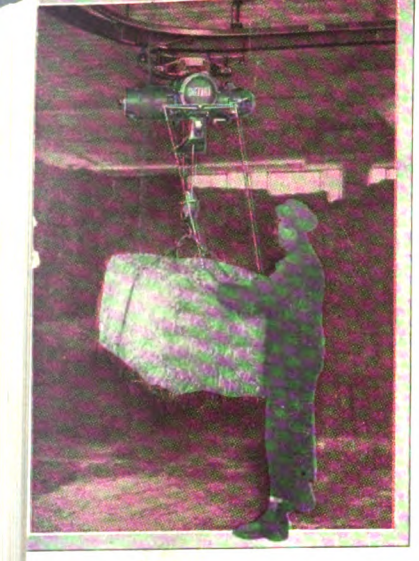
If in your plant there is confusion resulting from unnecessary handling and rehandling of materials and products, perhaps a Lamson Conveying System can give you the second picture of order. At your request, a Lamson engineer will study your handling and carrying problems. If conveyors are needed, we will devise them to meet your requirements. And after the installation is completed, we will gladly show you how to get the greatest service from it.

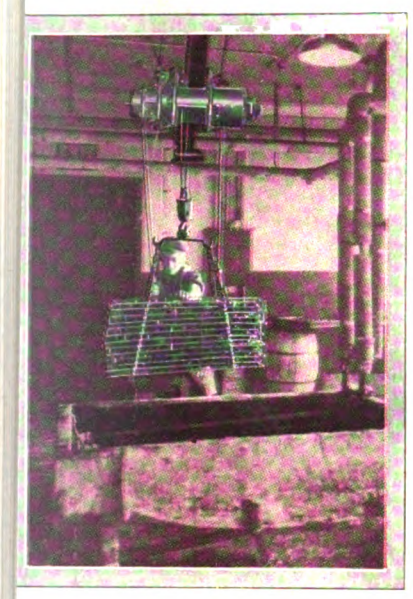
THE LAMSON COMPANY
SYRACUSE, N. Y.
Branches in Principal Cities

LAMSON SERVICE

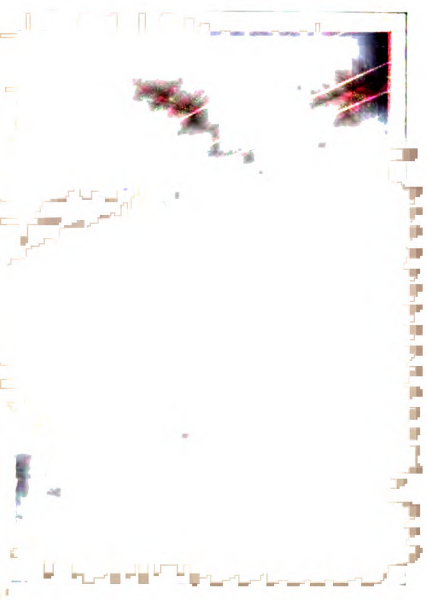
Lamson Conveying Systems

Digitized by Google





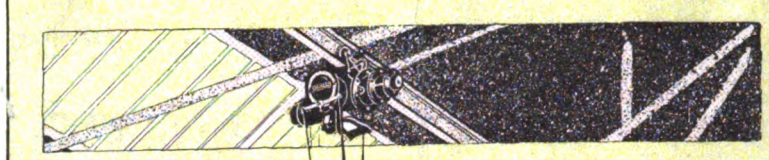




SHEPARD

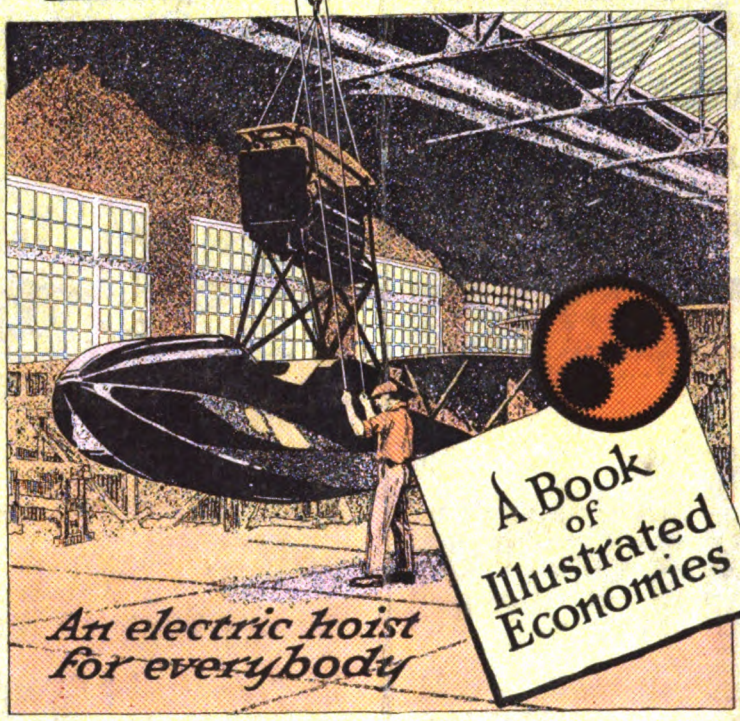
ELECTRIC CRANES & HOISTS

REG U.S. PAT. OFF.



THE SHEPARD ELECTRIC

LIFTABOUT











Here's the whole story

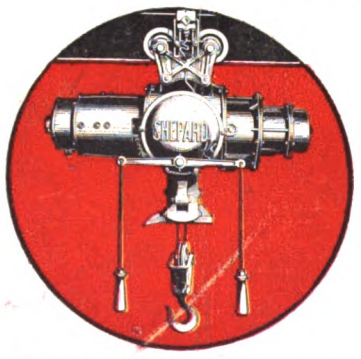
SEND FOR IT

Facts, figures, and pictures, a plenty made from actual photographs of many, many applications of this powerful little electric hoist.

We want to send you this "Book of Illustrated Economies," which describes and illustrates the savings in moving and lifting loads that have been brought to many businesses.

It will show you what the ***LiftAbout*** can do, and will give you a good idea of how this powerful little electric hoist could bring true economies to you.

You incur no obligation in sending for this book. It will be sent free to any business executive requesting it.



For your convenience we have provided this coupon.

Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.—
Send a free copy of your "Book of Illustrated Economies" to—

Firm.....

Attention of.....

Street.....

City & State.....

SHEPARD ELECTRIC CRANE & HOIST CO., 420 SCHUYLER Ave., MONTOUR FALLS, N.Y.

Branches in ... cities

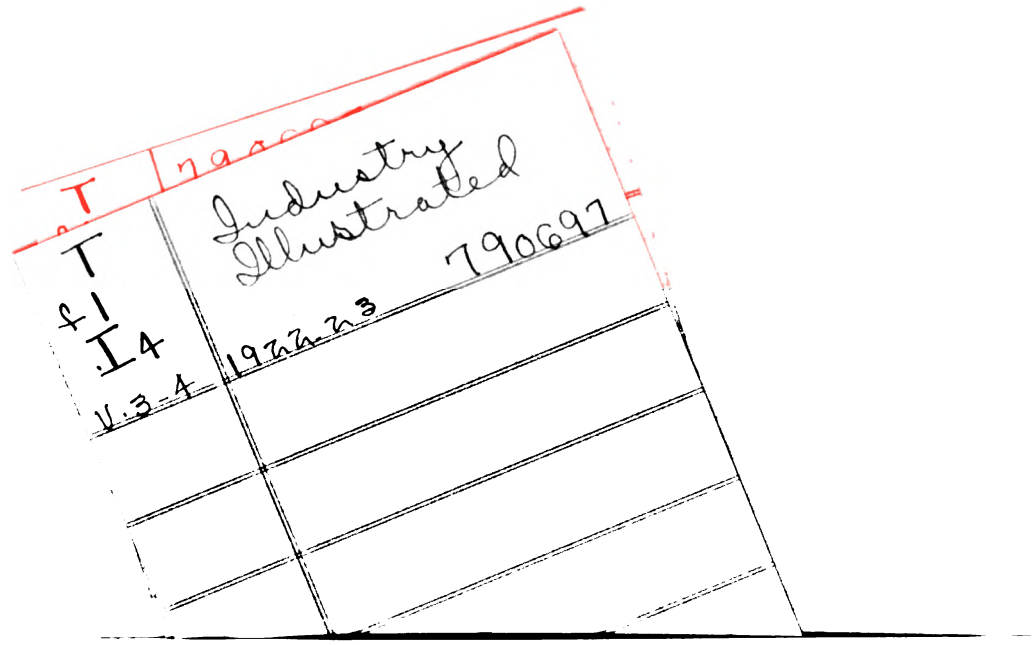
Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google


T
T
f I
.I4
V.3-4
Industry Illustrated
790697
1922-23

Digitized by Google

UNIVERSITY OF CHICAGO
097 896 183

Digitized by Google